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ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
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Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабаршысы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources CitationIndex, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

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SOLVING MINERALOGY PROBLEMS WITH THE HELP OF THE “ORIGIN" PACKAGE

Abstract. Algorithms for solving typical mineralogical problems associated with quantitative x-ray spectral analysis and quantitative x-ray phase analysis using the program “Origin” are developed. The calculation of the areas and midpoint of spectral lines using the tabular processor of the program “Origin” is considered. Various approaches to determining the parameters of spectral lines using the least squares method using the standard functions of the program “Origin” were tested. The creation of a user function for approximation of diffraction maxima by the Cauchy function taking into account the doublet character of K_a series of x-rays is also considered. Various built-in algorithms for smoothing functions (based on averaging, polynomial approximation and Fourier analysis – synthesis) were tested to find weak diffraction maxima against strong noise; optimal schemes for the application of these algorithms were found. The considered algorithms can be applied in universities when processing the results of laboratory works on the topics "Analysis of spectra of emission of atoms", "Quantitative x-ray spectral analysis" and "Quantitative x-ray phase analysis".

Key words: x-ray spectral analysis; x-ray phase analysis; least squares method; signal processing; smoothing functions; noise suppression.

Introduction. In the study of minerals in Geology and Mineralogy, the most important stage of the analysis is to determine the chemical composition and phase composition of the studied mineral samples. X-ray spectral analysis is the most common method for determining the composition, it allows to determine both the qualitative and quantitative composition of the sample using the emission x-ray spectra of the sample [1,5]. X-ray phase analysis is widely used to solve the problem of crystal phases identification and determination of their relative fractions in minerals. It is based on the determination of interplanar distances by radiographs, and then a search is carried out on the databases of the corresponding phases [2,4].

The determination of wavelengths in x-ray spectral analysis and the determination of interplane distances in X-ray phase analysis is based on the application of the Bregg-Wolfe formula, in which the measured parameter is the position of the diffraction maximum angle on the diffraction graph [3,4]. Quantitative X-ray spectral analysis and quantitative X-ray phase analysis are based on determining the areas under diffraction maxima and calculating through these areas the ratio of the number of elements or the ratio of the number of phases. This task is greatly complicated in cases where the diffraction lines of the phases overlap and it is not possible to distinguish individual lines in simple ways. In this case,

algorithms based on the least squares method (LSM) or on the methods of solving integral equations by A.N. Tikhonov regularization methods are used [6,7].

Usually such problems are solved with the help of expensive specialized programs or algorithms and programs created by users in such environments as Matlab, Fortran, etc. [8-12]. In the latter case, it is necessary to create long texts of algorithmic programs in programming languages, which can be done by experienced programmers only. Some tasks of this problem, however, can be performed very efficiently with the "Origin" package [13,14]; it does not require complex programming, and most of the necessary computational operations can be performed at the OSD level.

The purpose of this work is to develop a methodology for the analysis of radiographs using the "Origin " package, in particular methods for the precise determination of the angular position of the integral intensities and the angular width of the lines using the least squares method.

Research methods. In the case of X-ray spectral analysis and X-ray phase analysis, the typical view of the intensity dependence on the diffraction angle is as in figure 1. The functional dependence can be represented as several maxima 1-7, located on a smoothly changing background.

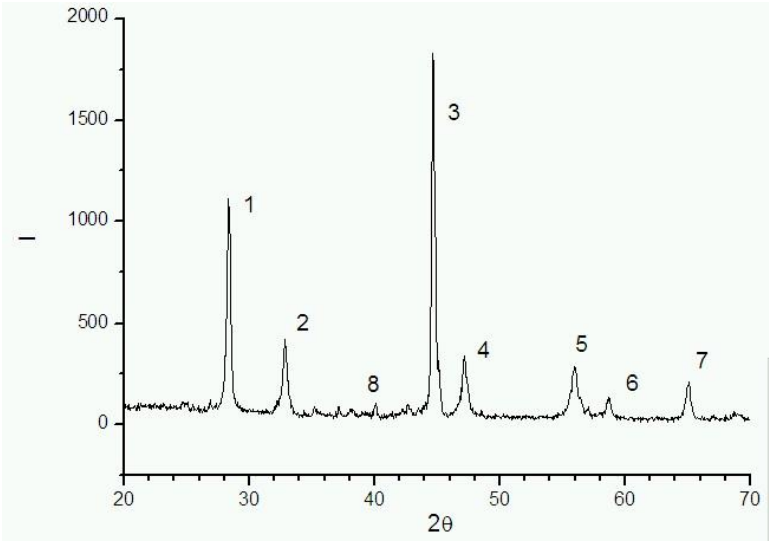

Figure 1 – Functional dependence of intensity on diffraction angle in case of phase analysis of polycrystalline sample

If the maxima are located without overlap, as in the case of 1, 2, 4-7 in figure 1, then in the "Origin" environment, it is advisable to calculate the determination of the positions of the lines as the position of the center of gravity of the figure formed by the graph and the background line, and the integral intensity as the area of this figure. To do this, first select a separate line, then find the background value at the edges of the lines, create a column describing the background as a linear function of the angle, and subtract the background function from the intensity values (2nd column), writing the result in the fourth column. Next, the 5th column is created equal to the slow multiplication of the elements of the 1st and 4th columns. Then through the menu "statistics\descriptive statistics\statistics in columns" calculate the sum of the elements of all columns. The area of a line is proportional to the sum of the elements of the 4th column, and the position of the center of gravity of the line is equal to the sum of the elements of the fifth column and the sum of elements of the fourth column. Thus, you can find the position of the center of gravity of the line and the area of the isolated line.

Results of the analysis of poorly resolved spectral lines. In the case of overlapping lines as in figure 1 (3rd line) or to improve the accuracy of determining the parameters of isolated lines, it is necessary to use the decomposition of a complex line into components using the least squares method (LSM). Then, using the parameters of the lines, you can find the positions of their center of gravity and the area of each line. In the package, the LSM is activated using the "analysis\fit multi peaks" menu; next, select the form of the "Gaussian" or "Lorentzian" peaks. In the case of Lorentzian, the decrease in intensity from the maximum to the edges of the line is slower than in the case of Gaussian.

In the case of Lorentzian, the shape of the line is given by the formula:

$$y = y_0 + \frac{2A}{\pi}\frac{w}{4(x-x_c)^2 + w^2}$$

In this formula: X_c - position of the center of gravity of the line; W - half-width of the line at half its height; A is the area of the figure below the line.

In the case of a Gaussian, the shape of the line is given by the formula

$$y = y_0 + \frac{A}{w\sqrt{\pi/2}} e^{-2\frac{(x-x_c)^2}{w^2}}$$

X_c - position of the center of gravity of the line; W - half-width of the line at half its height; A is the area of the figure below the line.

In both cases, each line is defined by 3 parameters. Another parameter describes a uniform background.

To determine the parameters of the lines in the program "Origin" after activating the menu "analysis\fit multi peaks\" you should specify the number of peaks and their approximate width. Next, double-click to mark the vertices of each peak. After that, the results of approximation of the experimental curve by Gaussians (Lorentzians) and a table containing the parameters of these peaks will appear on the graph.

Figure 2 shows an enlarged fragment of the X-ray (peaks 1 and 2 in figure 1) and the results of its decomposition into lorentzians.

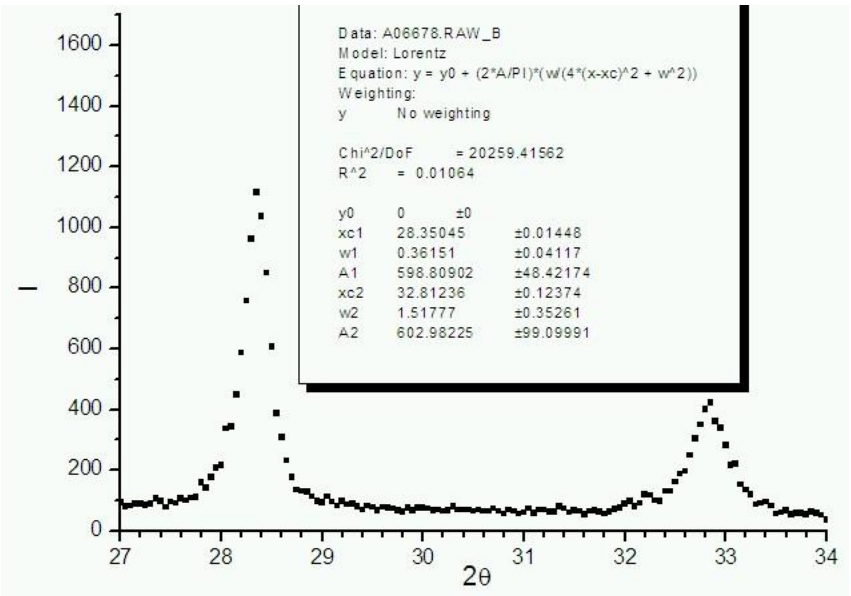

Figure 2 – The enlarged fragment of the radiograph (figure 1) and the results of its decomposition into lorentzians

The parameters of the lorentzians are given in the table inserted in figure 2, and the Protocol of the "Origin" program on the solution of this problem is given in figure 3.

[23.11.2019 08:26 "/Graph2" (2458810)]
Lorentz(2) fit to A06678.RAW_B:

Chi^2/DoF	20259,41562			
R^2	0,01064			
Peak	Area	Center	Width	Height
1	598,81	28,350	0,36151	1054,5
2	602,98	32,812	1,5178	252,92

Figure 3 – Protocol of the "Origin" program on the solution of the problem shown on figure 2

In the case of X-ray diffraction, the shape of the lines is approximated by the Cauchy function in the best way. This function is described by the Lorentzian squared. Also, the background near the X-ray line is often described not by a constant, but by a linear function of the angle. To improve the accuracy of analysis we must take into account the doublet nature of X-ray radiation, namely: instead of one line we must take into account two. The intensity and relative position of these lines is determined in accordance with the spectrum of K_a series of X-rays emitted by atom. There is no such function in the library of "Origin" ready-made functions. However, the program "Origin" provides the ability to create your own user function. To do this, go to the menu section "Analysis\Nonlinear Curve Fit\Advanced Fitting Tool\". In the window that appears, through the "Function\" menu, select the creation of a new function, set the number of its parameters (=7) and write in the window an expression characterizing the Cauchy function with 4 maxima:

P1 * P2 / (P2 ^ 2 + (x - P3) ^ 2) ^ 2 + P1 * P2/ (P2 ^ 2 + (x - P3 - 0,14) ^2) ^2 / 2 + P4 * P5 / (P5 ^ 2+ + (x -P6) ^ 2) ^ 2 + P4 * P5 / (P5 ^ 2 + (x - P6 - 0,14) ^ 2) ^ 2 / 2 + P7.

The number 0.14, calculated from the table data on the wavelengths of the doublet lines shows the shift of the K_{a2} component of the K_a doublet from the K_{a1} component by the diffraction angle in this formula; also, the formula takes into account that the K_{a2} component is weaker than K_{a1} by two times.

Next, through the "Action\Simulate\" menu, approximate values of the parameters P1 ... P7 of the user function should be set. After that, the menu item "Action\Fit" is activated ; in the new window that appears, press the "1 iter" button several times until the approximating curve of the red color approaches with satisfactory accuracy to the experimental points. The results of the parameter definition can be seen using the "Action\Parameters" menu.

An example of using this algorithm for the case of the third maximum (see figure 1), which consists four closely spaced, almost merged maxima from the two phases (two maxima K_{a1} and K_{a2} from each phase) is shown in figure 4.

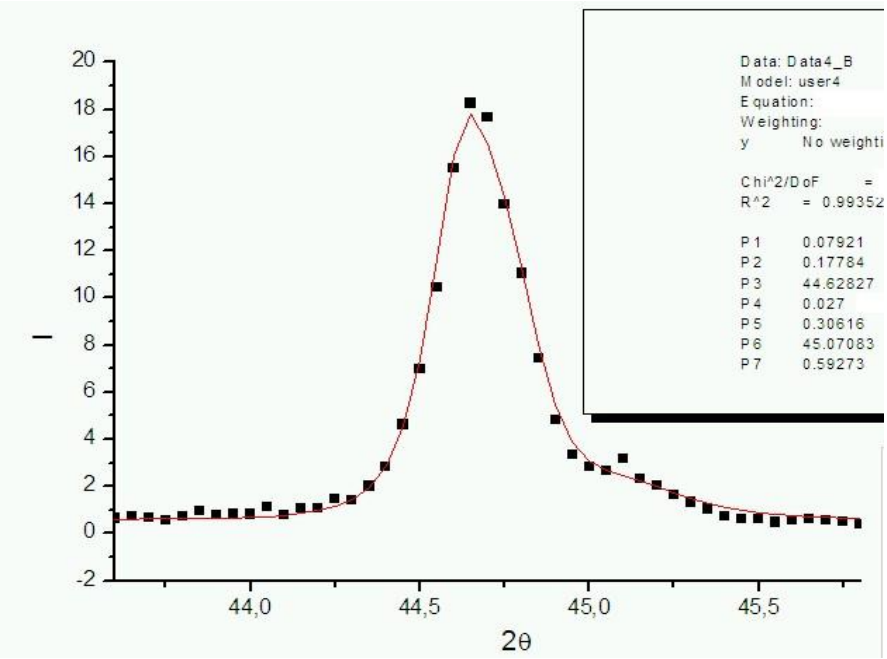

Figure 4 – The third maximum (shown in figure 1) and results of its decomposition into 2 components using Cauchy-function for aprocsimation of K_a –double spectra

The parameters of the Cauchy function for two maxima with doublet lines earch are inserted in figure 4.

The "Origin" program provides the possibility of smoothing functions in order to suppress noise in various ways to search for weak diffraction maxima. With these relatively simple algorithms, which are activated using the on-screen menu "Analisis\smoothing\", it is possible to smooth functions in three common ways.

The first group of smoothing algorithms (S-G - in figure 5) is based on smoothing through averaging the neighboring values of the function. You must correctly select the required number of points to the right and left of the calculated function value. This number should be increased in case of higher noise. However, excessive smoothing leads to smoothing and sharp maxima of the function and its sharp step differences.

The second group of algorithms (AA-in figure 5) draws a polynomial curve through the selected point and several adjacent points and selects the value of the polynomial at that point as the smoothed value. It is also necessary to choose the optimal number of points to the right and left of the calculated value of the function.

Smoothing functions based on using the third group of algorithms (FFT-in figure 5) are calculated via calculation of the Fourier image, correcting it in the high frequency domain and constructing a new corrected function as Fourier synthesis.

These three groups of anti-noise algorithms are activated using the on-screen menu In the Origin environment. The results of these algorithms work are presented in figure 5.

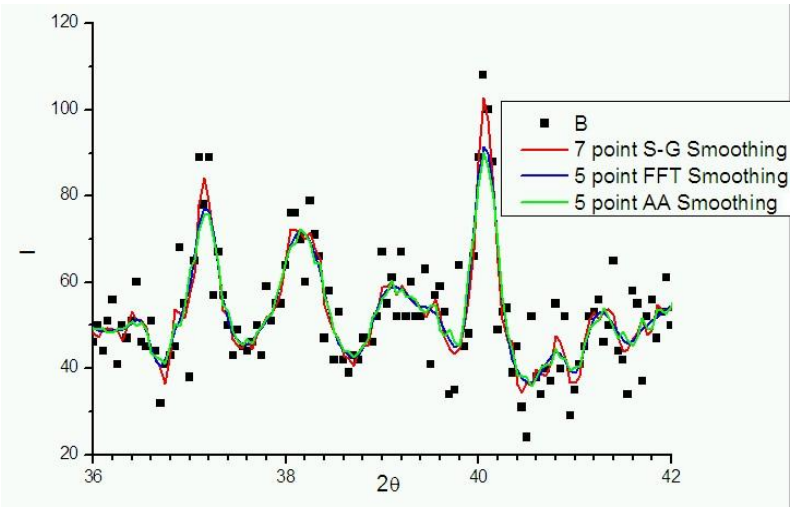

Figure 5 – The results of the application of smoothing algorithms:
S-G - through polynomial approximation; AA - by averaging the neighboring values of the function;
FFT - through the calculation and adjustment of the Fourier image

The best results of smoothing in our case of sharp maxima search against strong hindrances were reached at use of algorithms of smoothing through approximation (S-G) by a polynomial of the second order on 5-9 points. They should be applied to the processing of data with the aim of searching for weak diffraction peaks.

Conclusion. Algorithms for solving typical mineralogical problems associated with quantitative X-ray spectral analysis and quantitative X-ray phase analysis using the program “Origin” are developed.

These algorithms can be also used in universities when processing the results of laboratory work on the topics "Analysis of the emission spectra of atoms", "Quantitative x-ray spectral analysis" and "Quantitative x-ray phase analysis".

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«ORIGIN» ПАКЕТІ АРҚЫЛЫ МИНЕРАЛОГИЯ ЕСЕПТЕРІН ШЕШУ

Аннотация. «Origin» бағдарламасы арқылы сапалы және сандық рентгенді спектралдық талдау және сапалы, сандық рентгенді фазалық талдау негізінде минералогия мен материалтануға қатысты типтік міндеттерді шешу алгоритмдері әзірленді. Дифрактограммада максимумдарды жартылай автоматты іздеу процедуралары, «Origin» бағдарламасының кестелік процессоры, соның ішінде күрделі немесе симметриялы емес формадағы сызық көмегімен спектральді сызықтардың ауырлық аудандары мен орталықтары есептелді.

«Origin» бағдарламасына енгізілген стандартты аппроксимациялайтын функцияларды (Лоренц, Гаусс және басқа) пайдалана отырып, ең аз квадраттар әдісінің көмегімен спектрлік сызық параметрлерін анықтаудың түрлі тәсілдері бақылаудан өтті. Сонымен қатар, дифракциялық максимумды аппроксимациялау үшін пайдаланушы функциясын құру әдісі қарастырылды, аталған әдіс спектрлік және дифракциялық сызықтардың дәл аппроксимациясын қамтамасыз етеді, рентген сәулесінің k – сериясының дублеттік сипатын ескере отырып, аппроксимациялық функцияларды құру жолдары көрсетілді. Функция мәндерін бірнеше жақын орналасқан нүктелерде орташалауға; түрлі дәрежедегі полиномдармен аппроксимациялауға және функция мәні ретінде осы полином мәнін таңдауға; Фурье-бейненің жоғары жиілікті бөлігін түрлі тәсілдермен басу арқылы Фурье – анализ-синтезге негізделген функцияларды тегістеудің түрлі кіріктірілген алгоритмдері сынақтан өтті. Осы алгоритмдерді күшті кедергілер аясында әлсіз дифракционды максимумдарды іздеу үшін қолдану жолдары көрсетілді; аталған алгоритмдерді қолданудың оңтайлы схемалары анықталды. Мысал ретінде «Origin» пакетінің көмегімен төрт фазалы материалдың ұнтақ үлгісінің дифракционды спектрін талдау жұмыстары қарастырылды. Аталған спектр спектрді рентгенді флюоресценттік талдау мен зертханаларда рентгенді фазалық талдау үшін қолданылатын екі типтік жүктелген дифрактометр арқылы алынды. Аз квадраттар әдісі бойынша іріктелетін параметрлері бар функциямен аппроксимация негізінде қарапайым құрауыштарға әлсіз спектральді желілерді ыдырату жолымен рентгенограммаларды талдаудың аталған әдістерін қолдану ерекшеліктері қарастырылды. Қарастырылған алгоритмдерді заттардың, минералдар мен материалдардың фазалық құрамы мен құрылымын зерттеуге маманданған ғылыми және өндірістік зертханаларда қолдануға болады. Шағын өзгерістермен әзірленген әдістемелерді хроматография, радиофизика мен электротехникадағы өтпелі және шектік үдерістерді цифрлық осциллографиялау әдісімен алынған эксперименталды деректерді талдау барысында қолдануға болады. Сонымен қатар, бұл әдістемелерді университеттерде бакалавр мен магистрлер орындайтын зертханалық жұмыстар нәтижесін өңдеу кезінде «атомдарды шығару спектрлерін талдау», «сандық рентгенді спектралдық талдау» және «сандық рентгенді фазалық талдау», «Рентгенді спектроскопия», «Мессбауэрдік спектроскопия», «Эксперимент нәтижелерін өңдеу», «есептеу практикумы» тақырыптары бойынша қолданылады. Сипатталған әдістемелерді пайдалану барысында деректерді өңдеуде еңбекті көп қажет ететін – қолмен атқарылатын жұмыстар барынша азайтылып, жұмыс кезінде кездейсоқ жасалатын қателіктер азаяды әрі деректерді өңдеу үдерісі жеделдетіледі.

Түйін сөздер: рентгенді спектралдық талдау, рентгенді фазалық талдау, ең кіші квадраттар әдісі, сигналдарды өңдеу, функцияларды тегістеу, шуды бәсеңдету.

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РЕШЕНИЕ ЗАДАЧ МИНЕРАЛОГИИ С ПОМОЩЬЮ ПАКЕТА “ORIGIN”

Аннотация. Разработаны алгоритмы решения типичных для минералогии и материаловедения задач, связанных с проведением качественного и количественного рентгеновского спектрального анализа и качественного и количественного рентгеновского фазового анализа с помощью программы “Origin”. Рассмотрены процедуры полуавтоматического поиска максимумов на дифрактограммах, вычисление площадей и центров тяжести спектральных линий с помощью табличного процессора программы “Origin”, в том числе линий сложной или несимметричной формы. Опробованы различные подходы определения параметров спектральных линий с помощью метода наименьших квадратов с использованием стандартных аппроксимирующих функций (Лоренца, Гаусса и других), встроенных в программу “Origin”. Также рассмотрено создание функции пользователя для аппроксимации дифракционных максимумов на примере функции Коши, которая обеспечивает наиболее точную аппроксимацию спектральных и дифракционных линий, продемонстрировано построение аппроксимирующих функций с учетом дублетного характера k – серии рентгеновского излучения. Опробованы различные встроенные алгоритмы сглаживания функций, которые основаны: на усреднении значений функции в нескольких соседних точках; на аппроксимации полиномами различной степени и выборе значения этого полинома в качестве значения функции; на Фурье-анализе – синтезе с подавлением высокочастотной части Фурье-образа различными способами. Продемонстрировано применение этих алгоритмов для поиска слабых дифракционных максимумов на фоне сильных помех; найдены оптимальные схемы применения этих алгоритмов. В качестве примера рассмотрен анализ дифракционного спектра порошкового образца четырехфазного материала с помощью пакета “Origin”. Этот спектр был получен на типичном двукружном дифрактометре, применяемом для спектрального рентгеновского флюоресцентного анализа и рентгеновского фазового анализа в лабораториях. Рассмотрены особенности применения перечисленных методов анализа рентгенограмм путем разложения плохо разрешенных (по

критерию Релея) спектральных линий на простые составляющие с помощью аппроксимации функцией с подбираемыми параметрами по методу наименьших квадратов. Рассмотренные алгоритмы можно использовать в научных и заводских лабораториях, специализирующихся на изучении фазового состава и структуры веществ, минералов и материалов. С небольшими изменениями разработанные методики можно использовать при анализе экспериментальных данных, полученных методами хроматографии, цифрового осциллографирования переходных и пороговых процессов в радиофизике и электротехнике. Также эти методики можно применять в университетах при обработке результатов выполнения лабораторных работ выполняемых бакалаврами и магистрами по темам «Анализ спектров испускания атомов», «Количественный рентгеновский спектральный анализ» и «Количественный рентгеновский фазовый анализ», «Рентгеновская спектроскопия», «Мессбауэровская спектроскопия», «Обработка результатов эксперимента», «Вычислительный практикум». При использовании описанных методик сводится к минимуму трудоемкая ручная работа при обработке данных, благодаря чему уменьшается риск случайных ошибок при работе, ускоряется процесс обработки данных.

Ключевые слова: рентгеновский спектральный анализ; рентгеновский фазовый анализ; метод наименьших квадратов; обработка сигналов; сглаживание функций; подавление шумов.

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PIPELINE MULTIPLIER OF POLYNOMIALS MODULO WITH ANALYSIS OF HIGH-ORDER BITS OF THE MULTIPLIER

Abstract. Among public-key cryptosystems, cryptosystems built on the basis of a polynomial system of residual classes are special. Because in these systems, arithmetic operations are performed at high speed. There are many algorithms for encrypting and decrypting data presented in the form of polynomials. The paper considers data encryption based on the multiplication of polynomials modulo irreducible polynomials. In such a multiplier, the binary image of a multiply polynomial can serve as a fragment of encrypted text. The binary image of the multiplier polynomial is the secret key and the binary representation of the irreducible polynomial is the module.

Existing sequential polynomial multipliers and single-cycle matrix polynomial multipliers modulo do not provide the speed required by the encryption block. The paper considers the possibility of multiplying polynomials modulo on a Pipeline in which architectural techniques are laid in order to increase computing performance.

In the conclusion of the work, the time gain of the multiplication modulo is shown by the example of the multiplication of five triples of polynomials. Verilog language was used to describe the scheme of the Pipeline multiplier. Used FPGA Artix-7 from Xilinx companies.

The developed Pipeline multiplier can be used for cryptosystems based on a polynomial system of residual classes, which can be implemented in hardware or software.

Key words: Polynomial system of remainder classes, irreducible polynomials, remainder former, Pipeline modular multiplier.

Introduction. There are two approaches to multiplying polynomials modulo. At the first approach, multiplying modulo in two stages is performed [1, 2]. At the first stage, polynomials are multiplied, at the second stage, polynomials multiple by irreducible polynomials modulo. If at the first stage of multiplication polynomials are possible to accelerate on matrix circuits, then the accelerated of them multiplying modulo is difficult. At the second approach, process of multiplying modulo is divided into steps, and at each step of the multiplication polynomials is combined with the operation of reduction irreducible polynomials modulo. While, of multiplying polynomials are performed on a sequential circuit starting with the analysis of high-order [3] or left-most [4] bits of the polynomial multiplier.

To improve performance, one-clock multipliers of polynomials modulo with a matrix structure were developed [5-7].

The matrix structures of parallel multipliers have the potential improving performance - the possibility of pipelining, which is a prospective architectural technique [8].

Main part. During pipelining, the multiplying operation is divided into a finite number of sub-operations, and each sub-operation is performed at its own Pipeline stage, with all Pipeline stages are working of parallel. The results obtained at the i-th stage are transferred for further processing to the (i+1)-th Pipeline stage. Transmit of information from stage to stage is through the buffer memory located between them.

A stage that have accomplished of its sub-operation remember the result in the buffer memory and can start processing the next portion of the sub-operation data, while the next Pipeline stage uses the data stored in the buffer memory located at its output. Synchronization of the Pipeline is provided by clock pulses, the period of which is determined by the slowest Pipeline stage and the delay in the buffer memory element.

In a Pipeline multiplier of N stages, the multiplying data modulo can be input with an interval of N times less than for a matrix multiplier. Output results appear at the same pace.

A diagram of an N-stage of the Pipeline for multiplying a polynomial-multiplicand A(x) by a polynomial-multiplier B(x) modulo an irreducible polynomial P(x) shown in figure 1.

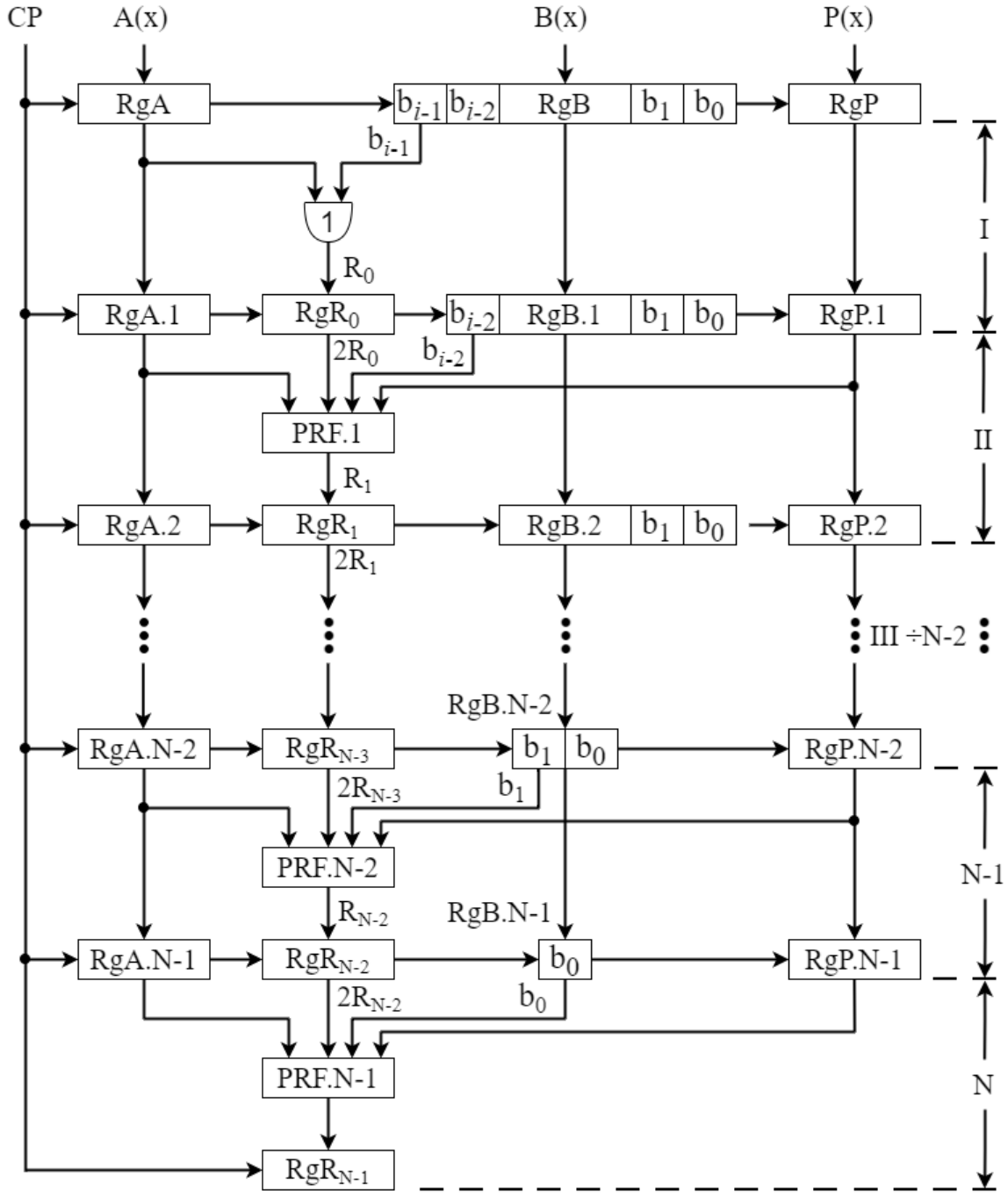

Figure 1 – Pipeline multiplier of polynomials modulo starting with analysis of high-order bit of the multiplier

The first Pipeline stage contains logical block diagram AND1 and buffer registers RgA.1, RgR_0, RgB.1and RgP.1. The second and next Pipeline stages contain logical blocks-former of partial remainders ($PRF_N \div PRF_{N-1}$). The second and other Pipeline stages have individual buffer registers. For example, the buffer registers of the second Pipeline stage are the registers RgA.2, RgR_1, RgB.2 and RgP.2. The buffer register of the N-stage is the Rg.N-1 register, in this diagram the registers RgA, RgB and RgP are the input Pipeline registers, where before the start of operations on the next triples of polynomials $A(x)_i$, $b(x)_i$ and $P(x)_i$, the *i*-th triple of polynomials is accepted.

Upon the first clock pulse CP1 is provided, the first triple of polynomials A, B, P from the input registers are transferred to the first stage of buffer registers. In the process this transfer, the contents input register RgA logical are multiplied by the high-order bit b_{i-1} polynomial-multiplier $B_1(x)$. The result of operations $A_1(x)\&b_{i-1}=R_0$ written to the first stage of buffer register RgR_0, and $A_1(x)$, $P_1(x)$ are accepted in the RgA.1 and RgP.1 registers.

According to the clock signal CP1, the second triple of polynomials A2(x), B2(x) and P2(x) are received to place of the first triples $A_1(x)$, $B_1(x)$ and $P_1(x)$ in the input registers. Upon the signal CP2 is provided, the contents of the input registers are transferred to the first stage of buffer registers, the contents of the first stage are transferred to the second stage of buffer registers RgA.2, RgR_1, RgB.2 and RgP.2. While, in the first Pipeline stage operation $A_2(x)$ $\&b_{i-1} = R_0$ is performed, reaches in RgR register. The buffer registers RgA.1, RgP.1 will receive the corresponding contents of RgA (A_2) and RgP (P_2).

During the action of the second pulse of CP2 in PRF.1, the operation and the calculation of the remainder $R_1 = (2R_0 \oplus A_1\&b_{i-2}) \bmod P_1$ saved in the buffer register RgR_1 are performed.

The clock signal CP2 into the input registers receives the polynomials of the third triples of polynomials $A_3(x)$, $B_3(x)$ and $P_3(x)$. Upon the third clock signal CP3 is provided, the third triples of polynomials $A_3(x)$, $B_3(x)$ and $P_3(x)$, will be processed by the logical blocks of the first stage (AND1), the second triples of polynomials $A_2(x)$, $B_2(x)$, and $P_2(x)$, will be processed by the logical blocks of the second stage PRF.1, the logic blocks of the third stage PRF.2 will process the first triples of polynomials $A_1(x)$, $B_1(x)$ and $P_1(x)$.

Upon the N-clock pulse CP.N is provided, the contents of the input registers polynomials $A_N(x)$, $B_N(x)$ and $P_N(x)$ will reaches to the first stage buffer registers, the contents of the first stage buffer registers to the second stage buffer registers, etc.

The results of processing the polynomials $A_1(x)$, $B_1(x)$ and $P_1(x)$ from the N-1 stage buffer registers will moved to the N-stage buffer register – Rg.N-1, while in PRF.N-1 $R_{N-1} = [(2R_{N-1} \oplus A_1(x)\&b_0)] mod P_1$ is calculated, which is the result of multiplying modulo $[A_1(x)*B_1(x)] mod P_1(x)$. The input registers receive the triples of polynomials $A_{N+1}(x)$, $B_{N+1}(x)$ and $P_{N+1}(x)$ with a clock signal CP.N.

Upon the clock pulses N+1, N+2, N+3, etc. is provided on the output Pipeline register Rg.N-1, the results of multiplying of triples of polynomials will be formed:

$$\begin{aligned} R_{N-1} &= [A_{N+1}(X) * B_{N+1}(X)] \bmod P_{N+1} \\ R_{N-1} &= [A_{N+2}(X) * B_{N+2}(X)] \bmod P_{N+2} \\ &\vdots \\ R_{N-1} &= [A_{N+k}(X) * B_{N+k}(X)] \bmod P_{N+k} \end{aligned}$$

The results of the sum modulo of two $2R_{i-1} \oplus A(x)b_i$ is provided to the left inputs is performed by the adder modulo of two Add.1. The value of P (x) is provided to the right inputs of Add.2. If, at the same time $C = 2R_{i-1} \oplus A(x)b_i > P(x)$ then in the high-order bit of the sum C the value $C_h = 1$ is formed. With this signal, block of diagram AND3, the result of adding $C \oplus P(x)$ at the output of Add.2 forming R_i is output. If $C = 2R_{i-1} \oplus A(x)b_i < P(x)$, $C_h = 0$. Then the value $C = 2R_{i-1} \oplus A(x)b_i$ by the signal $C_h = 1$ by the block of diagram AND2 the output is $C = R_i$.

Figure 2 shows the structure of the PRF_i. The central adder modulo 2 is the Add.2 adder.

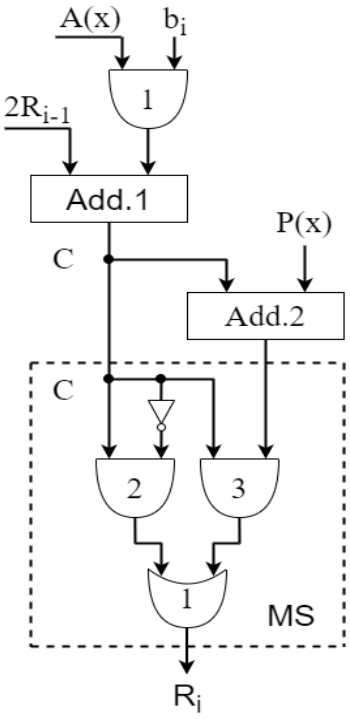

Figure 2 – PRF*i* structure

Consider the example of multiplying polynomials modulo on a five-stage Pipeline. Let:
$A_1 = x^3+x = 01010_2$; $B_1 = x^4+x^2+x = 10110_2$; $P_1 = x^5+x^2+1 = 100101_2$;
$A_2 = x^4+x^2 = 10100_2$; $B_2 = x^3+x^2+1 = 01101_2$; $P_2 = x^5+x^3+1 = 101001_2$;
$A_3 = x^4 + x^3 + 1 = 11001_2$; $B_3 = x^4 + x^2 + 1 = 10101_2$; $P_3 = x^5+x^3+x^2+x+1 = 101111_2$;
$A_4 = x^3 + x^2 + 1 = 01101_2$; $B_4 = x^3 + x^2 + x = 01110_2$; $P_4 = x^5 + x^4 + x^2 + x + 1 = 110111_2$;
$A_5 = x^4 + x = 10010_2$; $B_5 = x^4 + x = 10010_2$; $P_5 = x^5 + x^4 + x^3 + x^2 + 1 = 111101_2$.

The results of multiplying polynomials $A_1(x) \div A_5(x)$ by $B_1(x) \div B_5(x)$ modulo $P_1(x) \div P_5(x)$ are shown in figure 3.

	$A_1=x^3+x$ $B_1=x^4+x^2+x$ $P_1=x^5+x^2+1$	$A_2=x^4+x^2$ $B_2=x^3+x^2+1$ $P_2=x^5+x^3+1$	$A_3=x^4+x^3+1$ $B_3=x^4+x^2+1$ $P_3=x^5+x^3+x^2+x+1$	$A_4=x^3+x^2+1$ $B_4=x^3+x^2+x$ $P_4=x^5+x^4+x^2+x+1$	$A_5=x^4+x$ $B_5=x^4+x$ $P_5=x^5+x^4+x^3+x^2+1$	–	–	–	–
	CP1	CP2	CP3	CP4	CP5	CP6	CP7	CP8	CP9
I	$R_{01} = 01010_2$	$R_{02} = 00000_2$	$R_{03} = 11001_2$	$R_{04} = 00000_2$	$R_{05} = 10010_2$	–	–	–	–
II	–	$R_{11} = 10100_2$	$R_{12} = 10100_2$	$R_{13} = 11101_2$	$R_{14} = 01101_2$	$R_{15} = 11101_2$	–	–	–
III	–	–	$R_{21} = 00111_2$	$R_{22} = 10101_2$	$R_{23} = 01100_2$	$R_{24} = 10111_2$	$R_{25} = 01111_2$	–	–
IV	–	–	–	$R_{31} = 00100_2$	$R_{32} = 00011_2$	$R_{33} = 11000_2$	$R_{34} = 10100_2$	$R_{35} = 01100_2$	–
V	–	–	–	–	$R_{41} = 01000_2$	$R_{42} = 10010_2$	$R_{43} = 00110_2$	$R_{44} = 11111_2$	$R_{45} = 11000_2$

Figure 3 – The results of multiplying polynomials $A_1(x) \div A_5(x)$ by $B_1(x) \div B_5(x)$ modulo $P_1(x) \div P_5(x)$

From this figure 3
$R_{41} = [A_1(x) \cdot B_1(x)]$ *mod* $P_1 = 01000_2$, is corresponds to a polynomial: $R_{41} = x^3$;
$R_{42} = [A_2(x) \cdot B_2(x)]$ *mod* $P_2 = 10010_2$, is corresponds to a polynomial: $R_{42} = x^4 + x$;
$R_{43} = [A_3(x) \cdot B_3(x)]$ *mod* $P_3 = 00110_2 = x^2 + x$;
$R_{44} = [A_4(x) \cdot B_4(x)]$ *mod* $P_4 = 11111_2 = x^4 + x^3 + x^2 + x + 1$;
$R_{45} = [A_5(x) \cdot B_5(x)]$ *mod* $P_5 = 11000_2 = x^4 + x^3$.

In this figure 3, R_{ij} are the numbers of intermediate remainders $i(i = 0 \div 4)$ and the numbers of triples of numbers j, where $j = 1 \div 5$.Consider the time value. The multiplying time of polynomials without a Pipeline is determined by the formula:

$$T_{w.c} = NKT_K,$$

where K – the number of triples of polynomials to be multiplying, N – The number of Pipeline stages, T_K – the duration of the clock period, which is determined by the ratio $T_K = T_{PRF} + T_{BRg}$, where T_{PRF} – partial remainder formation time, T_{BRg} – time of recording of the processing results to buffer registers.

The runtime of operations on K input polynomial streams (triples of polynomials) at N Pipeline stages or with a clock period T_K is determined by the ratio [9]:

$$T_{NK} = \big(N + (K-1)\big)T_K.$$

The time value is determined by the formula:

$$C = \big(NK - (N + K - 1)\big)T_K.$$

For our example,

$$C = \big(NK - (N + K - 1)\big)T_K = (25 - 9)T_K = 16T_K.$$

The timing diagram and the results of the multiplying modulo the above triples of numbers on a five-stage Pipeline are shows in figure 4. Verilog HDL is used to describe the circuit of the Pipeline multiplier. Artix-7 from Xilinx as the Field Programmable Gate Array (FPGA) was chosen.

As shown in the figure 4, the first triple of polynomials $A_1(x)$, $B_1(x)$, $P_1(x)$ from the Pipeline input registers to the buffer registers of the first stage with the first clock signal CP1 are transferred. In this case, the partial remainder $R_{01} = 01010_2$ is calculated by the logical block of the first stage.

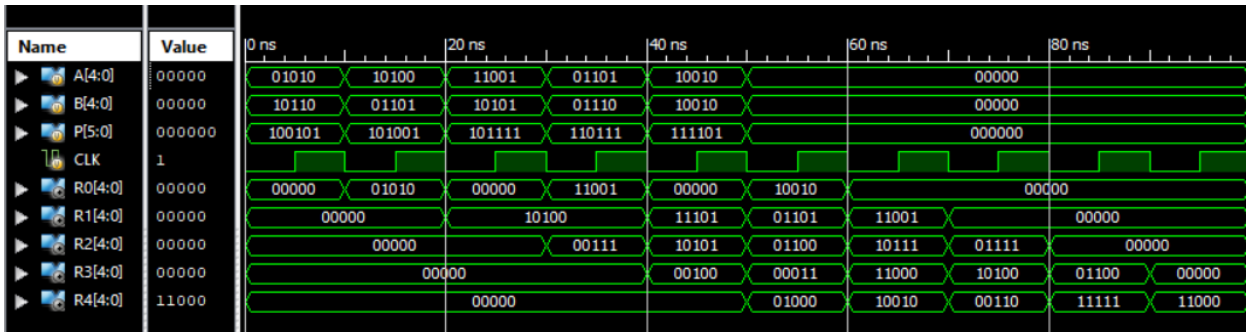

Figure 4 – The timing diagram of the Pipeline circuit

During the action of the second clock signal CP2, the second triple of polynomials $A_2(x)$, $B_2(x)$, $P_2(x)$ from the Pipeline input registers are transferred to the first stage buffer register, the contents of the first stage buffer registers are transferred to the second stage buffer registers. In this case, at the first stage $R_{02} = 00000_2$, at the second stage of the Pipeline, the remainder $R_{11} = 10100_2$ is calculated.

Upon the third clock pulse CP3 is provided from the Pipeline input registers, the triple of polynomials $A_3(x)$, $B_3(x)$, $P_3(x)$ are transferred to the first stage buffer registers, the contents of the first stage buffer registers are transferred to the second stage buffer registers, also the contents of the second stage buffer registers are transferred to the third stage buffer registers. While, a partial remainder $R_{03} = 11001_2$ is formed in the first stage of the Pipeline, $R_{12} = 10100_2$ and $R_{21} = 00111_2$ respectively are formed in the second and third stages of the Pipeline.

After the fourth clock pulse CP4 is provided, triple of polynomials $A_4(x)$, $B_4(x)$, $P_4(x)$ enter the inputs of the first stage of the Pipeline, the partial remainder $R_{04} = 00000_2$ is calculated of the first stage of the Pipeline, the remaining residues $R_{13} = 11101_2$, $R_{22} = 10101_2$, $R_{31} = 00100_2$ are formed on the other three stages.

Upon the fifth pulse CP5 is provided, triple of polynomials $A_5(x)$, $B_5(x)$, $P_5(x)$ enter the inputs of the first stage of the Pipeline, and at the first, second, third and fourth stages partial remainders $R_{05} = 10010_2$, $R_{14} = 01101_2$, $R_{23} = 01100_2$, $R_{32} = 00011_2$, $R_{41} = 01000_2$ are formed.

Upon the sixth pulse CP6 is provided to the inputs of the first stage of the Pipeline, polynomials are not provided and the remainders $R_{15} = 11101_2$, $R_{24} = 10111_2$, $R_{33} = 11000_2$, $R_{42} = 10010_2$ are formed on the corresponding 2, 3, 4, 5 stages of the Pipeline.

After the seventh pulse CP7 is provided the remainders $R_{25} = 01111_2$, $R_{34} = 10100_2$, $R_{43} = 00110_2$ in the 3, 4, 5 stages of the Pipeline are calculated.

The eighth clock pulse CP8 the remainders $R_{35} = 01100_2$, $R_{44} = 11111_2$ in stages 4, 5 are formed.

The ninth clock pulse CP9 completes the work of the Pipeline and in the fifth stages of the Pipeline the remainder R_{45} is calculated, which is the result $R_{45} = [A_5(x) * B_5(x)] \bmod P_5(x)$.

Conclusion. Considered pipeline scheme and calculation examples show that pipeline allows you to process a stream of three polynomials increasing the data encryption performance, which allows you to build a high-performance cipher process.

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КӨБЕЙТКІШТІҢ ЖОҒАРҒЫ РАЗРЯДТАРЫН ТАЛДАУ НЕГІЗІНДЕ ПОЛИНОМДАРДЫҢ МОДУЛЬ БОЙЫНША КОНВЕЙЕРЛІ КӨБЕЙТУ ҚҰРЫЛҒЫСЫ

Аннотация. Ашық кілтті криптожүйе ішінде қалдықтар жүйесінің көпмүшелік негізінде құрылған криптожүйелерінің алатын орны бөлек. Өйткені мұндай жүйеде арифметикалық амалдар жоғары жылдамдықпен орындалады. Көпмүшелік түрінде берілген мәліметтерді шифрлаудың тиімді тәсілі ретінде полиномдарды модульмен көбейту амалын алуға болады. Мұндай тәсілде көбейгіш ретінде шифрланатың мәтіннің белгілі бір фрагменті болып саналатын көпмүшеліктің екілік бейнесі алынса, ал көбейткіш ретінде құпия кілт болып табылатын көпмүшеліктің екілік бейнесі алынады. Модуль ретінде көбейтілетің көпмүшеліктің келтірілмейтін көпмүшеліктерінің бірі таңдалады.

Полиномдарды модульмен көбейтетін құрылғылардың ішінен жылдамдығы жоғары болып келетін матрицалық көбейту құрылғыларын атауға болады. Бірақ мұндай құрылғылардың өзі шифрлау жылдамдығын күрт өсіре алмайды. Шифрлау жылдамдығын арттыру үшін статьяда полиномдарды модульмен көбейтетін конвейер сұлбасының құрамы, логикалық құрылғылары, олардың ішкі ақпараттық байланыстары қаралады. Үштік полиномдар тізбегін конвейерде өңдеу ретіне мысалдар көрсетілген.

Жұмыстың қорытындысында бес сатылы конвейер арқылы полиномдардың бес үштігін (көбейгіш, көбейткіш, модуль) модульмен көбейтетін конвейер сұлбасының программаланатын логикалық интегралдық сұлбада (ПЛИС) Verilog тілінде іске қосылу жағдайы қарастырылды. Конвейер жұмысының уақыт диаграммасы мен модульмен көбейту нәтижелері келтірілген. ПЛИС ретінде Xilinx фирмалық өнімі Artix-7 таңдап алынған.

Алынған конвейер сұлбасы қалдықтар жүйесінің көпмүшелік негізінде құрылған криптожүйеде жылдамдығы жоғары шифрлау блогын құру үшін қолдануға болады.

Түйін сөздер: қалдық кластарының полиномдық жүйесі, келтірілмейтің полиномдар, қалдық құрастырушы, модуль бойынша конвейерлі көбейту құрылғысы**.**

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КОНВЕЙЕРНЫЙ УМНОЖИТЕЛЬ ПОЛИНОМОВ ПО МОДУЛЮ С АНАЛИЗОМ СТАРШИХ РАЗРЯДОВ МНОЖИТЕЛЯ

Аннотация. Среди криптосистем с открытым ключом особое место занимают криптосистемы, построенные на базе полиномиальной системы остаточных классов. Потому что в таких системах арифметические операции выполняются с высокой скоростью. Существует множество алгоритмов шифрования и расшифрования данных, представленных в виде многочленов. В работе рассматривается шифрование данных, основанных на умножении полиномов по модулю неприводимых полиномов. В таком умножителе двоичное изображение полинома-множимого может служить фрагментом шифруемого текста, двоичное изображение полинома-множителя является секретным ключом, а двоичное представление неприводимого полинома –модулем.

Существующие умножители полиномов последовательного действия и однотактные матричные умножители полиномов по модулю не обеспечивают ту скорость, которая требуется от блока шифрования. В работе рассматривается возможность умножения полиномов по модулю на конвейере, в котором заложены архитектурные приемы для повышения производительности вычисления.

В заключении работы приведен выигрыш по времени умножения по модулю на примере умножения пяти троек полиномов. Для описания схемы конвейерного умножителя был использован язык Verilog. В качестве ПЛИС выбран Artix-7 от компании Xilinx.

Разработанный конвейерный умножитель может быть использован для криптосистем на базе полиномиальной системы остаточных классов, которые могут быть реализованы программно-аппаратным или аппаратным способами.

Ключевые слова: полиномиальная система остаточных классов, неприводимые полиномы, формирователь остатков, конвейерный умножитель по модулю.

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BLOCKCHAIN TECHNOLOGIES FOR SECURITY AGAINST CYBER ATTACKS

Abstract. The article deals with new technologies for countering cyber attacks that can be aimed at destabilizing public order, large-scale disruption of communication systems, intimidation by imposing one's will, including on power structures, and, in general, pose an increased threat to the national and information security of the state. Particular attention is paid to blockchain technology, which allows to hide funds aimed at financing criminal, including terrorist activities, including in the information space. Also in the article, the authors present generalized research results as part of the implementation of the RFBR scientific project No. 18-29-16175 "Blockchain technology to counter the risks of cyberterrorism and cyber extremism: a criminal-legal study".

Modern cybercrime dictates new challenges to the state, which can no longer be responded to within the space of a single state. Today, the issue of legislative regulation of the interaction of states to prevent cybercrime with the use of new technologies is an acute issue.

The most important aspect of the new forms of countering cybercrime is the decentralization of users of anonymous proxy server systems. And if earlier security agencies still had available "loopholes" for direct access to the user's IP address, now everything has become much more complicated and a comprehensive analysis of the traffic of a particular user is necessary.

Scientists also point out that network attacks can contain malicious embedded code, the use of backdoors and much more. Such attacks can be triggered from anywhere in the world because of a computer with a masked IP-address. A new type of warfare, even cyber warfare, is changing the landscape of war itself.

This type of war eliminates the need to have physically capable armed forces and requires the need for forces with strong technical capabilities, such as computer skills.

Many countries, including Russia, have come to understand that this is a problem and are actively pursuing policies to address it in order to mitigate threats.

Key words: blockchain technology, Information Security, cybersecurity, counteraction, cybercrime, cyber terrorism, National security, cyberattack, financial security of Russia, VPN server, SORM - 3, cryptocurrency, Bitcoin, Litcoin, IP-address.

Introduction. The main task for modern states is the problem of creating a secure cyberspace, which can be achieved through the coordinated activities of international organizations, international regional organizations, and individual states. Scientists and scholars focus on the need to develop new approaches to ensuring the security of cyberspace, as well as examining modern technological threats of cybercrimes that can destabilize technological systems, lead to information leaks, and cause irreparable damage to state security [Antonyan & Aminov, 2019; Rybakov & Rybakova, 2019; Stepanenko et al, 2019; Bliznets et al, 2018; Polyakova et al, 2019].

Unauthorized access to data, programs, and other network resources is widespread today. Despite the use and use of various well-known methods, including law enforcement services, to protect online data, cybercriminals are finding new ways to penetrate the network. Nowadays it is not uncommon, in particular, in the United States (2018), when a mass cyber-attack affected 150 million people in a day, whose personal data was accessed through certain files in web applications. Another example, when in September 2018, already in Russia, the Aeroflot server was attacked by hackers, which led to the leak of a

large part of the source code. This data was freely available on GitHub. Despite the fact that due to the rapid response to the incident, the data was deleted quickly enough, they still managed to spread over the network, which made it possible to download them. Modern cyber-attacks are characterized by complexity, branching locations and a significant amount of damage, which makes it necessary to search for new means of ensuring the security of technological systems.

All this means that any leaks of information quickly become public, and, therefore, the data must be protected safety.

One of the reasons for existing cyber-attacks is their partial decentralization.

In this case, blockchain technologies can be used not only to protect personal data from possible cyber-attacks, but also to improve cybersecurity on various platforms in general. The introduction of blockchain technology will completely decentralize content, increasing cybersecurity in the storage chain of a large number of nodes, which will make it almost impossible for cyber-attacks. Blockchain technology is an opportunity to increase the cybersecurity of data storage and transportation, primarily due to the distributed data storage system on the computers of all network participants, and the absence of a central administrator [Nakamoto, 2008].

The blockchain is a multi-functional and multi-level digital system consisting of separate distributed registries, in which all transactions performed on an ongoing basis are tracked. Information stored in the blockchain is organized as a chain of individual blocks (hence the name "block ", "chain"), each subsequent block is linked to the previous one thus any changes to it automatically changes all subsequent blocks, and since the chain of blocks is stored on the computers of all users (owners) of this database, the changes cannot be unnoticed (Sukhodolov et al, 2019). Thus, once a transaction is made, it is impossible to execute it, since each transaction is recorded in the Ledger constantly in order, i.e. in chronological order. The database stores the entire history of transactions made within the chain, which is available to all users. When a new data block is created, the registry is updated simultaneously on all computers in the network, which eliminates the possibility of data distortion by one of the participants [Antonyan, 2020].

Thanks to these features, the system is transparent and reliable. In this case, a group of blocks together forms a blockchain network. Each block contains basically three values: the data itself; the previous hash value of the block; and the current value of the hash block. The hash value of the previous block is always zero in the Genesis block, since this is the very first block created. The hash function values for each block are generated using the hash function itself. The hashing technique briefly includes: a decentralized storage platform for secure transactions; strictly chronological order; immutability; no intermediaries; simple fraud identification; and data stability.

Methodology. We used a general scientific method of analysis that allowed us to argue the authors' positions on the use of blockchain technology for specific forms of cyber threats, to differentiate and update blockchain technology as a universal condition for preventing cyber-attacks and cybercrimes in the information technology environment. A comparative legal private method of studying the problems posed has proved acceptable for the correlation of the possibilities of using blockchain technology on various information platforms in order to increase cybersecurity. The method of abstraction allowed us to focus on certain extremely relevant properties of the blockchain technology, which is shown in individual examples of this technology from various spheres of professional and public activity (monetary transactions, supply chain management system, elections, etc.).

Research result. The biggest advantage of using blockchain to ensure the security of cybersystems is that when a cybercriminal tries to hack a separate block, the entire system analyzes each block of data to find one that is different from the rest. As a result, the system eliminates this type of block and identifies it as false.

In blockchain, if a node needs to update a specific part of the data in a transaction to a block, it must add a new transaction on top of the previous one in the block. Because even a small dot or comma is added to the data, the value of the hash function changes. Using this technique, the system easily detects which block contains incorrect or false data.

The most important aspect of the new forms of countering cybercrime is the decentralization of users of anonymous proxy server systems. And if earlier security agencies still had available "loopholes" for direct access to the user's IP address, now everything has become much more complicated and a comprehensive analysis of the traffic of a particular user is necessary.

In the Russian Federation, the main tool for combating cybercrime is the system SORM – 3 (the System of operational search measures – 3), which provides control of part of VPN servers, listens in real time to satellite communications, messengers, stores metadata about calls and Internet sessions, and allows you to get data from the operator's internal systems. Experts point out some difficulties in using SORM, for example, when cybercriminals use encryption programs for data packets, which makes it difficult or impossible to obtain computer information as evidence of criminal acts (Petrov & Makarov, 2020). The blockchain system is able to solve this problem. The absence of a single node that the attack is aimed in can ensure that the cyber-attack is decentralized across different blocks, thereby reducing the effectiveness of criminal influence. We believe that the use of blockchain will allow detecting traces of cybercrime that will be visible in the block chain and it will be almost impossible to mask them, which will negate illegal transactions and significantly complicate the activities of terrorist and extremist organizations. The ability to prevent cyber-attacks is inherent in the very principle of a decentralized block chain system, which not only provides a decentralized network for storing information, but also guarantees its security due to the resistance to hacking of hashed and encrypted blocks [Antonyan & Aminov, 2019].

Blockchain can become the technology that will significantly reduce the scale of criminal processes. Enabling cryptographic functions is used as a hash in each block, making it difficult for cybercriminals to access the blockchain network and change entries stored in the register. The most popular cryptographic hashing function is SHA256 / SHA512, which generates a unique hash value each time.

Discussion of the research results. A consensus algorithm is used to reach an agreement on the reliability of a single data value in a distributed network where untrusted nodes are present. A 51% consensus is required to accept a valid transaction. The consensus algorithm supports many real-world systems, including Google PageRank, smart grids with load balancing, clock synchronization, and drone management.

Currently, there is a positive practice of using blockchain technologies in various areas.

Monetary operation. One of the most important applications of blockchain is the transfer of money and storage of information without the help of banks. The digital currency is growing rapidly and is attracting the attention of major financial institutions. This cryptocurrency has been called "memory" in the literature on monetary Economics. Bitcoin is a peer-to-peer electronic money system in which no one controls or has a linked printed currency. Bitcoin allows anonymity in peer-to-peer electronic currency systems. Some argue that major benefits are lost if a trusted third party is needed to prevent double spending. The technical infrastructure of this decentralized digital currency is based on several cryptographic technologies.

Supply chain management system. More than a hundred years ago, supply chains were relatively simple because trade was local, but they have become incredibly complex. Throughout the history of supply chains, there have been innovations such as the shift to transporting goods by truck rather than rail, or the advent of personal computers in the 1980s, which led to dramatic shifts in supply chain management. It is incredibly difficult for buyers or buyers to truly evaluate the value of products because there is no transparency in the existing system. Similarly, it is extremely difficult to investigate supply chains when illegal or unethical practices are suspected. They can also be extremely inefficient, as suppliers try to combine opinions about who needs what, when, and how. Blockchain can increase the efficiency and transparency of supply chains and have a positive impact on everything from warehousing to delivery and payment.

Power strength. The blockchain can be used to transfer solar energy to neighbors. The app allows users to buy and sell a renewable energy resource by counting electrons and placing it on the blockchain.

Election. The traditional method of voting in the country is through a paper system or electronic voting, through a machine at a polling station, or online voting via a web browser. There is always a threat to the security of the voting system from potential attacks. Using the blockchain concept in the e-voting platform, transparency and additional verification of the elections for violations can be provided.

Blockchain technology is guaranteed to protect the system from forgery and fraud, which prevents terrorists and extremists from quickly and anonymously launching attacks and getting the information they need. The blockchain could be the basis of cybersecurity, in case the user data will be stored in its network. It protects your data from being hacked, stolen, or destroyed. If a hacker breaks into a traditional system, they can access thousands of objects, but if they break into a blockchain system, they will only get access to one block of information. This complicates the work of the criminal, since he will have to

decrypt each fragment separately to get all the information. Anti-terrorist groups in some countries already use supercomputers with advanced software, in particular blockchain technologies, to calculate the probability of cyber attacks, collect and analyze large amounts of data from the Internet, identify and recognize the location, movement and interpersonal relationships of cyberterrorists, as well as identify suspected individuals and control their criminal activities.

Scientists pay attention to the fact that network attacks can contain malicious embedded code, the use of backdoors, and much more. Such attacks can be initiated from anywhere in the world due to a computer with a masked IP address. A new type of war, even cyberwar, changes the landscape of war itself. This type of cyberwar eliminates the need to have a physically capable armed force and requires the need for forces with strong technical capabilities, such as computer science skills. Many countries, including Russia, have come to understand that this is a problem and are actively pursuing policies to address it in order to mitigate threats.

Conclusion. For cyberterrorists, there are a huge number of new tools and technologies available that allow them to commit criminal acts almost anywhere in the world. The tasks of ensuring cyberspace security are becoming an important element of state legal policy in modern States, and they are priority areas for ensuring national security, interstate cooperation, and the entire world community. The more technologically advanced a society is, the more it is interested in suppressing various types of cyber attacks and threats to technological systems that provide the state security system and other life-supporting digital platforms. The use of blockchain technologies in the security system will allow distributing a cyber-attack from a single node to different blocks of the blockchain system, which will ensure the stability of this system to counter cyber threats and attacks.

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КИБЕРШАБУЫЛ ҚАУІПСІЗДІГІ МӘСЕЛЕСІНДЕГІ БЛОКЧЕЙН ТЕХНОЛОГИЯЛАР

Аннотация. Мақалада қоғамдық тәртіпті тұрақсыздандыруға, байланыс жүйелерін ауқымды түрде бұзуға, өз еркіндігіне, соның ішінде билік органдарына қысым көрсету арқылы қорқытуға және жалпы алғанда мемлекеттің ұлттық және ақпараттық қауіпсіздігіне үлкен қауіп төндіретін кибершабуылдарға қарсы тұрудың жаңа технологиялары қарастырылады. Қылмыстық, террористік әрекеттерді, соның ішінде ақпараттық кеңістікті қаржыландыруға бағытталған қаражаттарды жасыруға мүмкіндік беретін блокчейн технологиясына ерекше назар аударылған. Сондай-ақ мақалада авторлар РБДР № 18-29-16175 «Кибертерроризм мен киберэкстремизм қауіп-қатеріне қарсы тұрудағы блокчейн технологиясы: қылмыстық-құқықтық зерттеу» ғылыми жобасын іске асыру аясында жалпыланған зерттеу нәтижелерін ұсынады.

Қазіргі заманғы киберқылмыс мемлекет алдына жаңа міндеттерді алға тартады, оған енді бір мемлекет кеңістігінде жауап беру мүмкін емес. Бүгінгі таңда жаңа технологияларды қолдана отырып, киберқылмыстың алдын алу үшін мемлекеттердің өзара қатынасын заңнамалық тұрғыда реттеу өзекті мәселе саналады.

Киберқылмыспен күресудің жаңа нысандарының маңызды аспектісі – анонимді прокси жүйелерді қолданушыларды орталықсыздандыру. Егер бұрын қауіпсіздік органдарына пайдаланушының IP-мекенжайы тікелей қолжетімді болса, қазір бәрі күрделене түсті және пайдаланушының трафигіне кешенді талдау қажет.

Ғалымдар сонымен қатар желілік шабуылдарда зиянды ендірілген код, артқы есікті пайдалану немесе басқалай болуы да мүмкін екендігі айтылған. Мұндай шабуыл әлемнің кез-келген нүктесінде жасырынған IP-мекенжайы бар компьютерге байланысты тууы мүмкін. Соғыстың жаңа түрі, тіпті киберсоғыстың өзі соғыс ландшафтын өзгертуде.

Соғыстың аталған түрі физикалық қабілетті қарулы күштер қажеттілігін жояды және компьютерлік шеберлік секілді қуатты техникалық мүмкіндікке ие күшті қажет етеді.

Көптеген елдер, оның ішінде Ресей де бұның күрделі мәселе екендігін түсініп, қауіпті азайту мақсатында шешу саясатын белсенді жүргізуде.

Түйін сөздер: блокчейн технологиясы, ақпараттық қауіпсіздік, киберқауіпсіздік, қарсы әрекет, киберқылмыс, кибертерроризм, ұлттық қауіпсіздік, кибершабуыл, Ресейдің қаржылық қауіпсіздігі, VPN сервері, ЖІШЖ – 3, риптовалюта, Биткойн, Литкоин, IP-мекенжайы.

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БЛОКЧЕЙН-ТЕХНОЛОГИИ В ВОПРОСАХ БЕЗОПАСНОСТИ ОТ КИБЕРАТАК

Аннотация. В статье рассматриваются новые технологии противодействия кибератакам, которые могут быть направлены на дестабилизацию общественного порядка, масштабное нарушение работы коммуникационных систем, устрашение путем навязывания своей воли, в том числе властным структурам и, в целом, представляют повышенную угрозу национальной и информационной безопасности государства. Особое внимание уделено блокчейн-технологии, которая позволяет скрыть средства, направленные на финансирование преступной, в том числе, террористической деятельности, в том числе в информационном пространстве. В статье представлены обобщенные результаты исследования в рамках реализации научного проекта РФФИ № 18-29-16175 «Блокчейн-технологии противодействия рискам кибертерроризма и киберэкстремизма: криминолого-правовое исследование».

Современная киберпреступность диктует новые вызовы государству, на которые уже нельзя реагировать в рамках пространства одного государства. Сегодня остро стоит вопрос законодательного регулирования вопросов взаимодействия государств по предотвращению киберпреступлений с использованием новых технологий.

Важнейшим аспектом новых форм противодействия киберпреступлениям является децентрализация пользователей анонимных систем прокси-серверов. И если раньше органы безопасности ещё имели доступные «лазейки» для прямого выхода на IP-адрес пользователя, то теперь всё стало намного сложнее и необходим комплексный анализ трафика того или иного пользователя.

Также ученые обращают внимание на то, что сетевые атаки могут содержать вредоносный встроенный код, использование бэкдоров и многое другое. Такие атаки могут быть инициированы из любой точки мира из-за компьютера с маскированным IP-адресом. Новый тип войны, даже кибервойны, меняет ландшафт самой войны.

Этот тип войны устраняет необходимость иметь физически дееспособные вооруженные силы и требует потребности в силах, обладающих сильными техническими возможностями, например, навыками информатики.

Многие страны, в том числе и Россия, пришли к пониманию того, что это проблема, и активно ведут политику для ее решения в целях смягчения угроз.

Ключевые слова: блокчейн-технологии, информационная безопасность, кибербезопасность, противодействие, киберпреступность, кибертерроризм, национальная безопасность, кибератака, финансовая безопасность России, VPN-сервер, СОРМ – 3, криптовалюта, биткойн, литкойн, IP-адрес.

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DETERMINATION OF CUTTING SPEED VALUES FOR PROCESSING A NON-RIGID SHAFT

Abstract. This article discusses the flexibility of the technological system due to the influence of external shear forces on it during processing of non-rigid parts such as bodies of revolution. In order to reduce the deformation of the part during the P_y cutting force is applied to it, various fastening schemes are used and, accordingly, calculations are made on the rationality of its choice. The bending moments M_1 and M2 in sections Z_1 and Z_2 are determined in an analytical way (curve part). The cutting force is calculated according to the formula (1), and also according to formulas (2) and (3) there are determined the points of maximum and minimum deflection of the non-rigid shaft. By transforming formulas (1), (2) and (3), the formulas (4), (5) and (6) were derived. Using formula (4), the values of the cutting speed V along the entire length of the shaft part L were calculated, and the cutting force P_y at each fixed point Z_1 to Z_{21} was determined from the obtained expressions (5) and (6). The block diagram and software implementation in the Delphi XE8 environment are presented in which calculations are performed so that the minimum value of the shaft deflection always has a constant value y=const. A graphical dependence of the change in cutting force on the values of the cutting speed is obtained. The developed subsystem will also allow to visually display how you can avoid various errors during the machining of a non-rigid part (shaft).

Key words: cutting speed, cutting force, mechanical machining, shaft deflection, task algorithm, scheme, software module, secondary circuit.

During the processing of non-rigid shafts, the technological system «Machine → Fixture → Tool → Workpiece» is essentially very malleable to the influence of cutting forces (external shear forces) and thereby complicates the processing of the product. All these difficulties can occur due to the displacement of the cutting tool and the workpiece, that lead to errors, the divergence of the axes of the base elements of the MFTW system, as well as thermal and inertial disturbances that affect the technological system, where the deformation of the workpiece increases during turning (in the form of deflection).

Under a non-rigid shaft there is understood when the length L exceeds its diameter ∅ by 10-12 times, that is, the condition $\frac{L}{d} \geq 10 \div 12$ [1] must be met.

During processing of a workpiece of a non-rigid shaft, it is necessary to reduce the deflection and make it uniform along its entire length under the influence of cutting force, as well as to reduce the imbalance of the rotating workpiece. In order to reduce the deflection of the non-rigid shaft under the influence of the radial cutting force P_y, there are used various fastening schemes. The verification calculation determines the feasibility of choosing a fastening scheme, in which the maximum value and the minimum value of the deflection of the workpiece are found. The Figure 1 shows the deflection of the workpiece under the influence of the cutting force P_y. The non-rigid shaft workpiece is fixed rigidly in the lathe chuck by the front end and by the end with the rear center (tailstock), which has less rigidity. Therefore, the workpiece of the non-rigid shaft will be presented as a beam on two supports. In order to determine the deflection of the workpiece, there were determined the reactive forces $R_A = R_B = \frac{P_y}{2} = = Z_1 = Z_2 = \frac{L}{2}$ [2]. The values of the bending moment in the section Z_1 $M_1(Z_1) = P_y \cdot \frac{Z_1}{2}$ in the interval

$\left(0 \le Z_1 \le \frac{L}{2}\right)$ and the bending moment in the section Z_2 $M_2(Z_2) = R_a \cdot Z_2 - P_y\left(Z_2 - \frac{L}{2}\right)$ in the interval $\left(\frac{L}{2} \le Z_2 \le L\right)$ were found. Therefore, having carried out mathematical transformations, formulas were derived for calculating the deflection in the intervals $0 \le Z_1 \le \frac{L}{2}$ and $\frac{L}{2} \le Z_2 \le L$ [3].

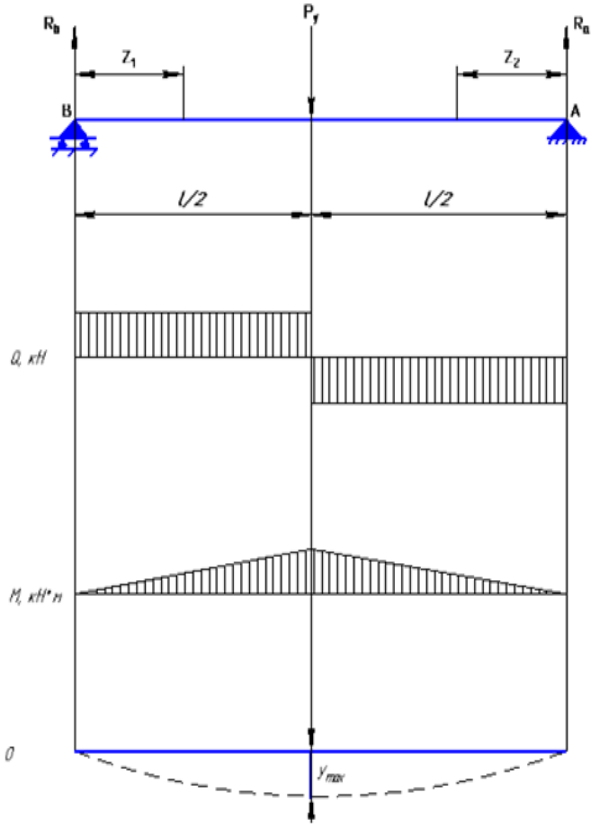

Figure 1 – Determination of the maximum deflection of a non-rigid shaft

The purpose of this work is to increase the accuracy of processing, the constancy of the shape and geometric dimensions of non-rigid shafts. In order to achieve this goal, it is necessary to determine the values of the cutting speed V so that the minimum deflection value remains constant along the entire length of the workpiece during turning, programmatically to calculate and to create a graph the values of cutting speed V and a graph of P_y dependence on cutting speed V.

The radial cutting force can be considered as a function of several arguments [4, 5]:

$$P_y = C_{py} \cdot t^x \cdot S^y \cdot V^n \cdot K_p, \quad (1)$$

where C_{py} – coefficient of material and processing conditions; t^x – cutting depth (allowance); S^y – feed (feed rate); V^n – cutting speed; K_p – total correction coefficient.

Using the above formula (1), we determine the cutting force:

$$P_y = 243 \cdot 2^{0,9} \cdot 0,21^{0,6} \cdot 50,27^{-0,3} \cdot 2,48.$$

$$y = \frac{P_y}{48 \cdot E \cdot J_x} \cdot \left[4 \cdot Z^3 - 8\left(Z - \frac{L}{2}\right)^3 - 3 \cdot L^2 \cdot Z\right] \quad (2)$$

$$y = \frac{P_y}{48 \cdot E \cdot J_x} \cdot [4 \cdot Z^3 - 3 \cdot L^2 \cdot Z] \quad (3)$$

According to expressions (2) and (3), in the intervals $0 \le Z_1 \le \frac{L}{2}$ and $\frac{L}{2} \le Z_2 \le L$ there were determined points with the maximum deflection of the non-rigid shaft y=0.06878 and the minimum deflection y=0.010281885.

Let carry out the permutation of the variables in the formula (1) and by the inverse task we obtain the formula (4) by which the values of the cutting speed V along the entire length of the workpiece of a non-rigid shaft will be calculated.

$$V^n = \sqrt[0,3]{\frac{P_y}{C_{py} \cdot t^x \cdot S^y \cdot K_p}} \Rightarrow V = \left(\frac{P_y}{C_{py} \cdot t^x \cdot S^y \cdot K_p}\right)^{\frac{1}{n}} \quad (4)$$

Transforming expression (2) and expression (3) we obtain formulas (5) and (6), by which it will be possible to determine how the cutting force changes from the cutting speed at the points of contact along the entire length of the workpiece of a non-rigid shaft.

$$P_y = \frac{y \cdot 48 \cdot E \cdot J_x}{4 \cdot Z^3 - 8\left(Z - \frac{L}{2}\right)^3 - 3 \cdot L^2 \cdot Z} \quad (5)$$

$$P_y = \frac{y \cdot 48 \cdot E \cdot J_x}{4 \cdot Z^3 - 3 \cdot L^2 \cdot Z} \quad (6)$$

To determine the values of the cutting speed V along the entire length L of the workpiece, there is developed a step-by-step calculation algorithm according to State standard 19.701-90, which is presented on figure 2 [6].

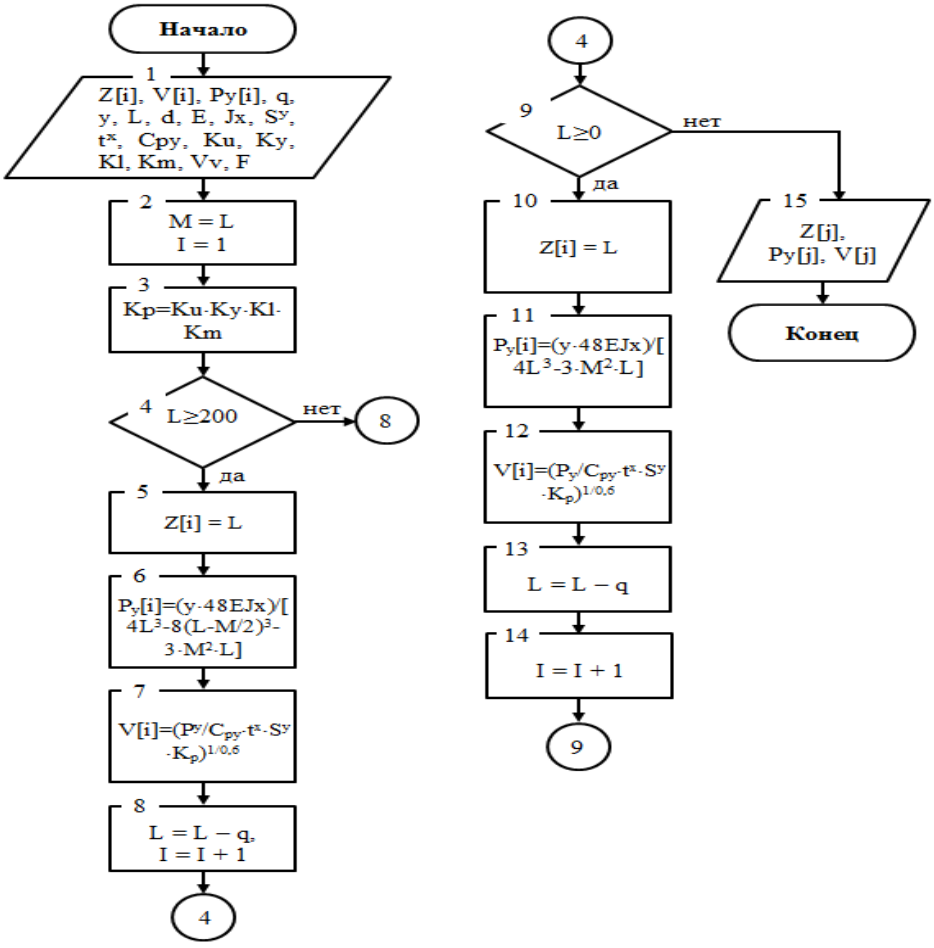

Figure 2 – A block diagram of the calculations [6]

As a basis, we select the value of the minimum deflection y=0.010281885, then we change the cutting speed V along the entire length of the work piece by a step of 20 mm, but so that the specified amount of deflection always remains constant. According to the above formulas, we carry out the calculations.

At the point Z_1=400. At the starting point Z_1 the cutting force P_{y1}=136.12, then V_1=50.25.

Z_2=380 P_{y2}=136.12 V_2=50.25	Z_7=280 P_{y7}=25.69 V_7=13002.5	Z_{12}=180 P_{y12}=20.65 V_{12}=26852.26	Z_{17}=80 P_{y17}=35.83 V_{17}=4292.08
Z_3=360 P_{y3}=68.75 V_3=489.68	Z_8=260 P_{y8}=23.16 V_8=18437.80	Z_{13}=160 P_{y13}=21.56 V_{13}=23204.73	Z_{18}=60 P_{y18}=46.62 V_{18}=1785.18
Z_4=340 P_{y4}=46.62 V_4=1785.18	Z_9=240 P_{y9}=21.56 V_9=23204.73	Z_{14}=140 P_{y14}=23.16 V_1=18437.80	Z_{19}=40 P_{y19}=68.75 V_{19}=489.68
Z_5=320 P_{y5}=35.83 V_5=4292.08	Z_{10}=220 P_{y10}=20.65 V_{10}=26852.26	Z_{15}=120 P_{y15}=25.69 V_{15}=13002.5	Z_{20}=20 P_{y20}=136.12 V_{20}=50.25
Z_6=300 P_{y6}=29.60 V_6=8098	Z_{11}=200 P_{y11}=20.35 V_{11}=28232.43	Z_{16}=100 P_{y16}=29.60 V_{16}=8098	Z_{21}=0 P_{y21}=136.12 V_{21}=50.25

The processing of a work piece of a non-rigid shaft will be draft, since the cutting depth is t=2 mm, without auxiliary equipment (lunette), since the length of the work piece is L=400 mm, d=40 mm.

On the basis of calculations, there was developed a software module in the object-oriented programming language Delphi XE8 [7,8] for an automatic control system along the secondary circuit (V cutting speed control). The figure 3 shows the software implementation interface and a graph of the cutting speed V for stable values of bends along the entire length of the work piece, as well as a graph of the cutting force P_y values from the cutting force V for stable values of bends along the entire length of the work piece.

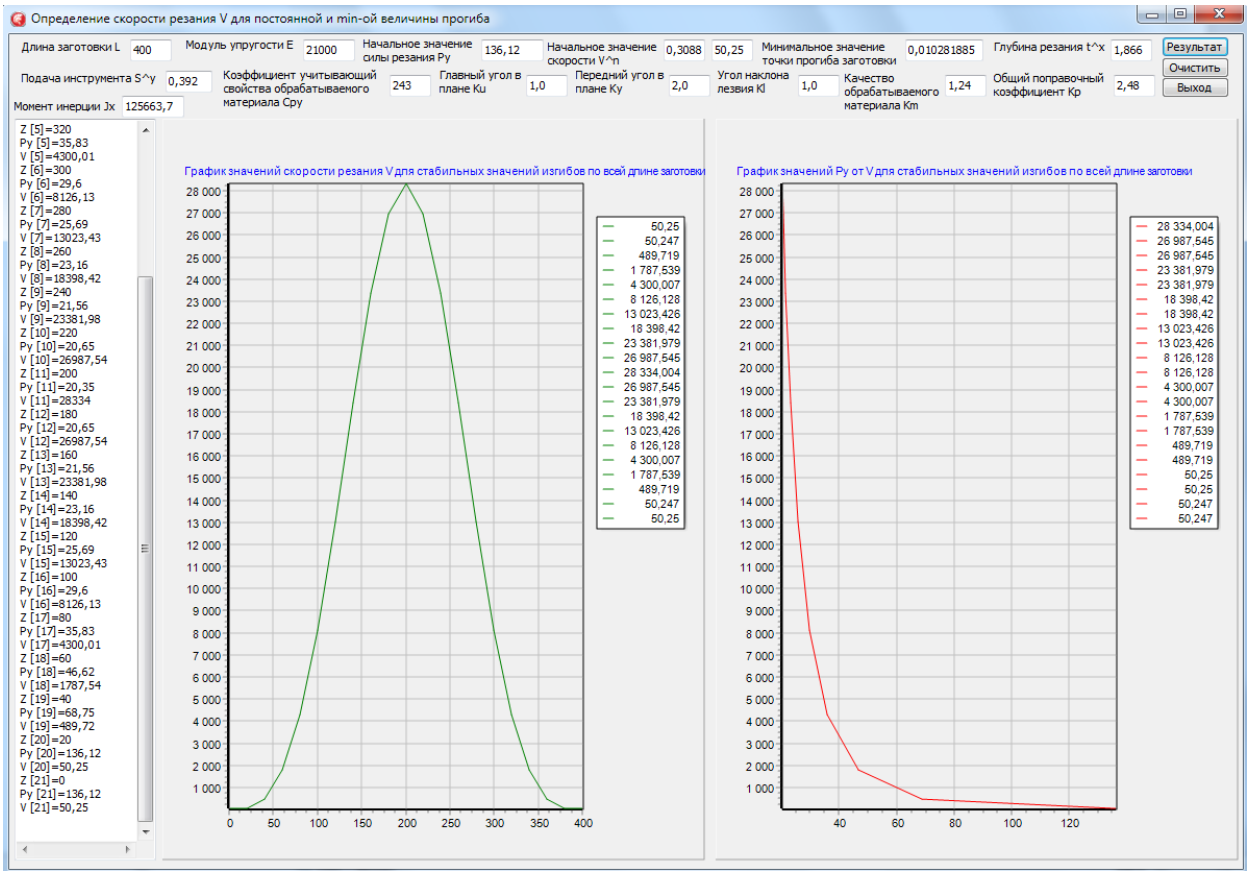

Figure 3 – Determination of the cutting speed V for a constant shaft deflection

Obtained results:

1. By mathematical transformations, there was obtained the formula $V = \left(\frac{P_y}{C_{py} \cdot t^x \cdot S^y \cdot K_p}\right)^{\frac{1}{n}}$ for the necessary changes in the values of the cutting speed and the necessary values of the cutting force P_y in order to maintain a constant value of the deflection of the work piece.

2. Developed a step-by-step calculation algorithm and software application. The software application does not require special skills for the user (designer-technologist, turner-processor), thereby significantly reducing the time required for calculations, it also allows to vary the data in choosing the length of the work piece, its diameter, cutting depth, tool feed, cutting speed, determining the cutting force.

3. Received graphs of the values of the cutting speed and a graphical dependence of the change in cutting force on the values of the cutting speed.

4. Increased productivity due to processing in one pass without reinstallation.

5. The ability to process work pieces of a non-rigid shaft without readjustment by changing data in the developed software module.

Therefore, all this will reduce the cost of manufacturing and engineering products, such as non-rigid shafts.

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ЖҰМСАҚ БІЛІКТІ ӨҢДЕУДЕГІ КЕСУ ЖЫЛДАМДЫҒЫНЫҢ МӘНІН АНЫҚТАУ

Аннотация. Машина жасау өнімінің дәлдігі мен сапасы конструкция мен материал қасиетінің (қатаңдық, тозуға төзімдік, беріктік, дірілге төзімдік және тағы басқа шамалар) жиынтығына тәуелді. Жұмсақ білікті өңдеу үрдісі күрделі және көп еңбекті қажет етеді, өйткені жону арқылы өңдеу кезінде технологиялық жүйенің қатаңдығына тәуелді деформацияға байланысты түрлі қателік анықталады. Осы мақалада айналмалы дене түріндегі жұмсақ тетіктерді жону арқылы өңдеу кезінде сыртқы көлденең күштердің технологиялық жүйеге әсерінің икемділігі қарастырылады. Тетікке радиалды кесу күші P_y әсер еткен кездегі деформацияны азайту үшін бекітудің түрлі сұлбалары қолданылады және оңтайлы таңдау жасауға қажетті есептеу жүргізеді. Жұмсақ білікті өңдеуде бекітудің төрт әдісін қолданылады: 1 – жұмсақ дайындаманы патронға немесе консолды жиектемеге бекіту; 2 – жұмсақ дайындаманы патронға немесе біліктің бос ұшын люнетке қысу арқылы жиектемеге бекіту; 3 – жұмсақ тетіктерді люнеттің көмегінсіз орталыққа бекіту; 4 – жұмсақ дайындаманы люнетпен бірге аралық ортасына бекіту. Қателік шамасын анықтау мен азайту үшін қосалқы жабдықсыз (люнет) «3» бекіту сұлбасы таңдап алынған. Аналитикалық тәсілмен (эпюр аймақтары) Z_1 және Z_2 қималарындағы ию моменттері $M_1(Z_1) = \frac{P_y}{2} \cdot Z_1$ және $M_2(Z_2) = R_a \cdot Z_2 - P_y\left(Z_2 - \frac{l}{2}\right) = \frac{P_y}{2} \cdot Z_2 - P_y\left(Z_2 - \frac{l}{2}\right)$ анықталды. Радиалды кесу күші P_y (1) өрнекпен анықталып, $0 \le Z_1 \le \frac{L}{2}$ аралығына (2) өрнек, ал $\frac{L}{2} \le Z_2 \le L$ аралығына (3) алынды. Қол жеткізген нәтижелер бойынша жұмсақ біліктің ең үлкен және ең кіші ию нүктелері анықталды. (1), (2) және (3) өрнектерді түрлендіру арқылы (4), (5) (6) өрнектер алынды. (4) Өрнек Z_1 ден Z_{21} дейінгі аралықтағы әрбір тіркелген нүктеде белгілі кесу күші арқылы P_y (5 және 6 өрнек) $0 \le Z_1 \le \frac{L}{2}$ және $\frac{L}{2} \le Z_2 \le L$ аралығында берілген адыммен q жұмсақ біліктің ұзындығы L бойымен кесу жылдамдығын V анықтауға мүмкіндік берді. Алынған есептеу өрнегі кесу үрдісі кезінде жұмсақ біліктерді токарлық өңдеу дәлдігін арттырады. Есептеу уақытын қысқарту және нәтижеге тез қол жеткізу үшін «АЖЖ-технолог» бағдарламалық кешеннің «II контур бойынша кесу жылдамдығын реттеу» бағдарламалық модулі пайдаланылды. Бұл «АЖЖ-технолог» бағдарламалық кешені Embarcadero RAD Studio Delphi XE8 нысанды-бағытталған ортада жасалған бірнеше бағдарламалық модульден тұрады және 16К20 жону-бұрама кескіш білдекте жұмсақ біліктерді өңдеу кезінде жұмыс режимін автоматты реттеу жүйесінің (АРЖ) платформасына бейімделген. Жасалған алгоритм (блок-сұлба) бойынша «II контур бойынша кесу жылдамдығын реттеу» бағдарламалық модулі кесу жылдамдығының V әсерінен Т15К6 кескіш аспабының жұмсақ білік дайындамасының ұзындығы бойымен орын ауыстырып, белгіленген нүктеде Z_i дайындамаға түсіретін қысымын есептейді. Сондай-ақ «II контур бойынша кесу жылдамдығын реттеу» бағдарламалық модульде келесі ауыспалы шамаларды түрлендіруге болады: білік дайындамасының ұзындығын L; білік

дайындамасының диаметрі *d*; адым *q*; әдіп *t* (кесу тереңдігі); өңделетін материал қасиеттерін ескеретін коэффициент C_{Py}; кескіш аспап берілісін *S*; кескіш аспаптың негізгі бұрышының әсерін ескеретін түзету коэффициенті $K_{\square}$; кескіш аспаптың алдыңғы бұрышының әсерін ескеретін түзету коэффициенті $K_{\square}$; кескіш аспаптың негізгі кесу жиегінің еңкею бұрышының әсерін ескеретін түзету коэффициенті $K_{\square}$; өңделетін материал сапасының күш тәуелділігіне әсерін ескеретін түзету коэффициенті $K_{\square}$ және жалпы түзету коэффициентін анықтау K_p; кесу күшінің P_y және кесу жылдамдығының *V* бастапқы мәндерін беру. Ауыспалы мәнді түрлендіру компьютерлік тәжірибе жүзінде қатаң біліктің ұзындығы бойымен тұрақты июге арналған кесу жылдамдығының мәнін график түрінде динамика өзгерісін және радиалды кесу күшінің P_y жылдамдыққа тәуелділігін бейнелеуге, сонымен қатар жұмсақ тетіктерді механикалық өңдеу үрдісінде пайда болуы мүмкін түрлі қатенің алдын алуға мүмкіндік береді.

Түйін сөздер: кесу жылдамдығы, кесу күші, механикалық өңдеу, білікті ию, тапсырма алгоритмі, бағдарламалық модуль, екінші контур.

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ОПРЕДЕЛЕНИЕ ЗНАЧЕНИЙ СКОРОСТИ РЕЗАНИЯ ДЛЯ ОБРАБОТКИ НЕЖЁСТКИХ ВАЛОВ

Аннотация. От совокупности свойств конструкций и материала (жёсткость, износостойкость, прочность, виброустойчивость и другие параметры) зависит качество и точность машиностроительных изделий. Считается, что процесс обработки нежёстких валов – весьма сложный и трудоемкий, так как при токарной обработке выявляются различные погрешности, возникающие за счёт деформаций, зависящих от жёсткости технологической системы. В приведенной статье рассматривается податливость технологической системы вследствие влияния на неё внешних поперечных сил при токарной обработке нежёстких деталей типа тел вращения. Для того, чтобы уменьшить деформацию детали при воздействии на неё радиальной силы резания P_y, используют различные схемы крепления и соответственно производят расчёты на рациональность её выбора. В большинстве при обработке нежёстких валов используют четыре способа крепления: 1 – закрепление нежёсткой заготовки в патроне или на оправке консольно; 2 – закрепление нежёсткой заготовки в патроне или на оправке с поджатием свободного конца нежёсткого вала на люнет; 3 – закрепление нежёсткой детали в центрах без люнета; 4 – закрепление нежесткой заготовки в центрах с люнетом в середине пролета. Для снижения и определения величины погрешности была выбрана схема крепления «3» без вспомогательного оборудования (люнета). Аналитическим способом (участки эпюр) определены изгибающие моменты $M_1(Z_1) = \frac{P_y}{2} \cdot Z_1$ и $M_2(Z_2) = R_a \cdot Z_2 - P_y\left(Z_2 - \frac{l}{2}\right) = \frac{P_y}{2} \cdot Z_2 - P_y\left(Z_2 - \frac{l}{2}\right)$ в сечениях Z_1 и Z_2. Радиальная сила резания P_y рассчитана по формуле (1) и соответственно через подстановку переменных были получены выражение (2) для интервала $0 \le Z_1 \le \frac{L}{2}$ и выражение (3) для интервала $\frac{L}{2} \le Z_2 \le L$. По полученным результатам определены точки максимального и минимального прогиба нежёсткого вала. Путем математического преобразования формул (1), (2) и (3) были выведены формулы (4), (5) и (6). Формула (4) позволила вычислить необходимые значения скорости резания *V* по длине нежёсткого вала *L* с заданным шагом *q* в интервале $0 \le Z_1 \le \frac{L}{2}$ и в интервале $\frac{L}{2} \le Z_2 \le L$ с определенной силой резания P_y (формулы 5 и 6) в каждой фиксированной точке с Z_1 по Z_{21}. Полученные формулы расчёта позволят повысить точность токарной обработки нежёстких валов в процессе резания. Для сокращения времени и получения быстрых результатов расчёта был использован программный модуль «Регулирование скорости резания по II контуру» программного комплекса «САПР-технолог». Данный программный комплекс «САПР-технолог» разработан в объектно-ориентированной среде Embarcadero RAD Studio Delphi XE8 и состоит из нескольких программных модулей, адаптирован под платформу автоматической системы регулирования (АСР) режимов работ при обработке нежёстких валов на токарно-винторезном станке 16К20. По разработанному алгоритму (блок-схема) программный модуль «Регулирование скорости резания по II контуру» просчитывает, как режущий инструмент Т15К6 под действием скорости резания *V* перемещается вдоль длины заготовки нежёсткого вала и в каждой фиксированной точке Z_i оказывает давление на заготовку. Также в программном модуле «Регулирование скорости резания по II контуру» можно варьировать следующими переменными: длиной заготовки вала *L*; диаметром заготовки вала *d*; шагом *q*; припуском *t* (глубина резания); коэффициентом учитывающего свойства обрабатываемого материала C_{Py}; подачей режущего инструмента *S*; коэффициентом поправочным, который учитывает влияние главного угла в плане режущего инструмента $K_{\square}$; коэффициентом поправочным, который учитывает влияние переднего

угла режущего инструмента $K_{\square}$; коэффициентом поправочным, который учитывает влияние угла наклона главного лезвия режущего инструмента $K_{\square}$; коэффициентом поправочным, который учитывает влияние качества обрабатываемого материала на силовые зависимости $K_{\square}$ и определить общий поправочный коэффициент K_p; задавать начальные значения силы резания P_y и начальное значение скорости резания V. Варьирование переменными позволяет на стадии компьютерного эксперимента отобразить изменение динамики в виде графика значений скорости резания для стабильных изгибов по всей длине нежёсткого вала и зависимость радиальной силы резания P_y от V, а также визуально отобразить, как избежать различных ошибок, которые могут возникнуть в процессе механической обработки нежёстких деталей типа тел вращения на токарно-винторезном станке за один проход.

Ключевые слова: скорость резания, сила резания, механическая обработка, прогиб вала, алгоритм задачи, схема, программный модуль, второй контур.

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BLAST-WAVE IMPULSE COMPACTION OF THE VISCOELASTOPLASTIC MOLDING SAND

Abstract. This article examines the compaction process in the green molding sand by the explosive impulse of combustion gas. The study was taken on a testing device based on the semi-automatic molding machine. The dependence of mold density on impulse power and physical and mechanical properties of the sand has been found. An explosion pressure wave drives the sand column in a flask. The sand moves gradually by layers. Each layer first accelerates, then moves uniformly, decelerates and eventually stops. Here, the layer is compacted due to the kinetic energy of its movement. The higher the velocity of the molding sand is, the higher its kinetic energy and the compressive stress gained during the compaction, are. Fluidity of the molding sand depends on its physical and mechanical properties, particularly on its viscosity. The behavior of viscous, elastic and plastic properties of the molding sand during the compaction process has been researched using the self-designed device. During the compaction process, the parameters interchange, while the value of the sum is constant. During the acceleration phase, the molding sand has minimal elastic properties, the viscous properties recede and plastic properties enhance. During the uniform motion of the sand, its viscous properties are minimal, while the plastic properties enhance to the maximum. Then till the end of the process, viscous properties keep enhancing up to 80…90 %, while plastic properties recede almost to zero. Elastic properties slightly enhance almost linearly during the whole process.

Key words: molding sand, compaction process, impulse, viscosity, elasticity.

Introduction. The key factors that affect molding are the physical and mechanical properties of molding sand and the compaction parameters. The studies [1-10] of compaction process in green sand molds by general impulse methods have revealed the effect of power impulse on molding sand in flasks. The pressure wave goes through the molding sand volume and drives it in direction to the pattern plate. Here, the molding sand layers located near the pattern plate, start moving the last and stop the first when decelerating on the pattern plate. The motion of the sand layers comprises acceleration, uniform motion and deceleration phases. When accelerating, the molding sand gains kinetic energy $E = \sum\left(\frac{m\upsilon^2}{2}\right)$ that goes into compaction when the sand decelerates on the pattern plate and the pattern. Here m is the mass of a moving elementary volume of the sand; υ is its velocity. The higher the velocity of the molding sand is, the higher its kinetic energy and the compressive stress gained during the compaction, are.

The compaction mechanism in green molding sands has viscoelastoplastic character [11]. It's similar to how the material reacts to rolling and drawing [12, 13]. The green molding sand is supposed to behave the same way when being loaded. To provide the required quality of impulse-based molding, an effect of viscous, elastic and plastic components on each phase of compaction process has to be estimated.

Methods. The study was carried out on a testing device (figure 1) based on the semi-automatic molding machine 1 model 22111, additionally provided with the combustion chamber 2 with a pre-ignition chamber 3, a fan 4 and an ignition device 5. The testing device allows for explosive compaction in flasks 6 sized 300×360×(100÷200) mm with working pressure in the combustion chamber 0.2-0.3 MPa and working pressure rise time to maximum 0.02-0.08 s. Methane was used as the combustion gas. Atmospheric oxygen acted as an oxidizer.

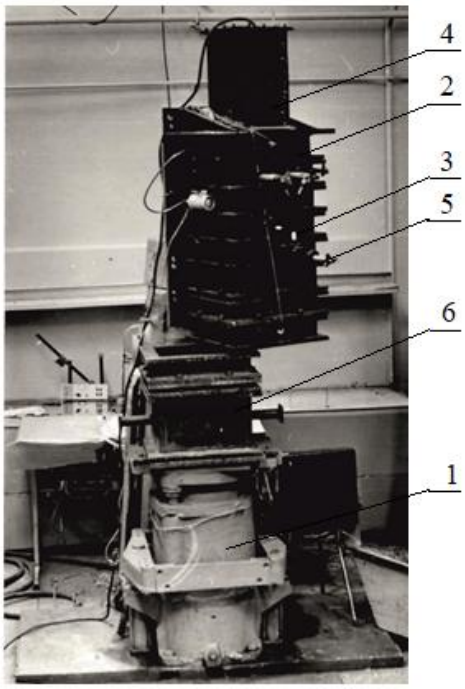

Figure 1 – The testing device

Piezoelectric crystal pressure sensors with a sensing element made of lithium niobate with measurement range 0-3.0 MPa and resonance frequency 50.0 kHz were used for recording processes at the combustion chamber. Resistance strain gauges model 2ФПКА with measurement range 0-2.5 MPa and resonance frequency 30.0 kHz were used for recording compressive stresses in the molding sand. All stress measurements were duplicated using the load cells with a sensing element made of lead. Displacement sensors type ДП6 were used for strain gaging of molding sand.

The tests revealed that the density of the mold compacted by combustion gas wave pressure, depends on the load impulse parameters, strain rate of the molding sand and compressive stresses occurring during the compaction. Under a short-time loading, the compaction process does not keep pace with loading, i.e., a delay of deformation of the molding sand from the loading occurs. Here, the delay time depends on the physical and mechanical properties of the molding sand, particularly on the viscous properties.

Figure 2 shows the travelling speeds of the layers of molding sands with the same moisture content W = 3,2%, depending on the initial bulk mass of the sand δ_o and the rise time t of the load impulse $N = \frac{P}{t}$, where P is explosion pressure, MPa; t is the pressure rise time to a maximum, s. Molding sand is 200 mm off the pattern plate.

The looser molding sand (δ_o = 820 kg/m^3) gains the maximum velocity υ = 4.6 m/s and the maximum impulse P = 0.3MPa within rise time 0.025 s. The more consistent molding sand (δ_o = 890 kg/m^3) gains the velocity υ = 4.3 m/s and maximum impulse P = 0.3 MPa within rise time 0.024 s. This implies that under more powerful load impulse N, inter-particle attraction in the loose molding sand is weaker that one in the consistent sand and therefore break more easily. Thus, the delay time between the beginning of deformation of molding sand and the load impulse decreases; whereas the strain and strain rate increase. It is common knowledge that the inter-particle attraction in the molding sand are provided by the films of clay binder, the predominant property of which is viscosity. It is logical to assume that viscosity markedly affects the impulse compaction process.

According to the P. N. Aksyonov's pressing equation [14]:

$$\delta_t = \delta_o + (\delta_1 - \delta_o)\sigma_{(t)}^K, \quad (1)$$

for the explosive compaction process, it can be written:

$$\delta_t = \delta_o + (\delta_1 - \delta_o)\,\sigma_{(t)}^K\, B_{(t)}, \quad (2)$$

where δ_t is the compacted density of molding sand; δ_o is the initial density of molding sand; $(\delta_1 - \delta_o)$ is the density increment under the pressure of 0.1 MPa; $\sigma_{(t)}$ is the stress combination in the molding sand; K is an empirical coefficient; $B_{(t)}$ is a coefficient representing the strain rate of the molding sand and its physical and mechanical properties, particularly its viscosity.

The more viscosity and the strain rate of the molding sand are, the less coefficient $B_{(t)}$ is; and, as shown in Equation (2), the less is the sand final density. Therefore, under impulse compaction, compared to pressing, the molding sand gets undercompacted. In this context, the viscosity of the molding sand becomes a critical factor in choosing sand composition for this compaction method.

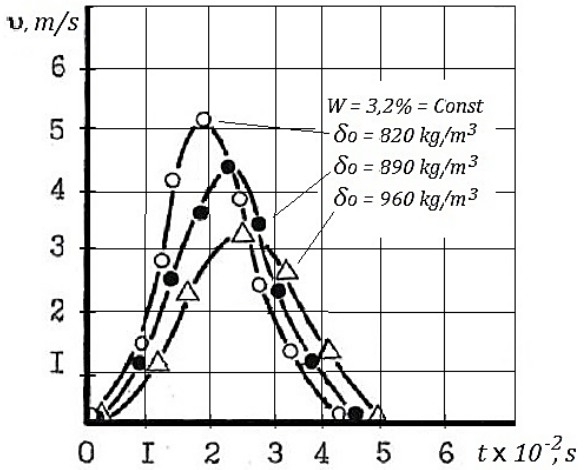

Figure 2 – The effect of the load impulse rise time *t* and initial bulk density δ_o of the molding sand to the velocity *υ* of the sand layers

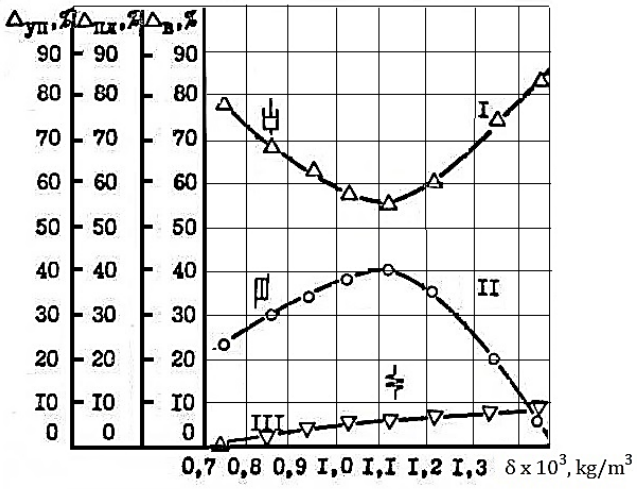

Figure 3 – The interchange of viscous (I), plastic (II) and elastic (III) properties of the molding sand during the compaction process

To determine the effect of the molding sand viscosity on its undercompaction degree under explosive molding, a method and a testing device were designed. The method of determining the sand viscosity involves comparing residual deformations (and, therefore, densities) of a standard specimen after pressing and explosive compaction under equal compressive stresses appearing in the sand. In order to calculate the effect of the molding sand viscosity on its undercompaction degree, the following formula is laid down:

$$\Delta\varepsilon_{\text{вяз}} = \frac{\varepsilon_{\text{стат}} - \varepsilon_{\text{дин}}}{\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}}}, \quad (3)$$

where $(\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}})$ is the total deformation of the molding sand; $\Delta\varepsilon_{\text{вяз}}$ is the effect of the molding sand viscosity on its total deformation; $\varepsilon_{\text{стат}}$ is the residual deformation of the molding sand after static pressing; $\varepsilon_{\text{дин}}$ is the residual deformation of the molding sand after explosive compaction; $\varepsilon_{\text{упр}}$ is the elastic deformation of the molding sand.

In terms of the molding sand density, Equation (3) is written as follows:

$$\Delta\delta_{\text{вяз}} = \frac{\delta_{\text{стат}} - \delta_{\text{дин}}}{\delta_{\text{стат}} - \delta_{\text{о}} + \delta_{\text{упр}}} \cdot 100\%, \quad (4)$$

where $\delta_{\text{стат}}$ is the residual density of the standard specimen after static pressing; $\delta_{\text{дин}}$ is the residual density of the molding sand after explosive compaction; $\delta_{\text{упр}} = \delta_{\text{полн}} - \delta_{\text{ост}}$ is the change in volume of the molding sand caused by elastic deformation.

The effect of plastic and elastic properties of the molding sand on its deformation is calculated the following way:

$$\Delta\varepsilon_{\text{пл}} = \frac{\varepsilon_{\text{дин}}}{\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}}}, \quad (5)$$

$$\Delta\varepsilon_{\text{упр}} = \frac{\varepsilon_{\text{упр}}}{\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}}}, \quad (6)$$

$$\Delta\delta_{\text{пл}} = \frac{\delta_{\text{дин}} - \delta_{\text{о}}}{\delta_{\text{стат}} - \delta_{\text{о}} + \delta_{\text{упр}}} \cdot 100\%, \quad (7)$$

$$\Delta\delta_{\text{упр}} = \frac{\delta_{\text{упр}}}{\delta_{\text{стат}} - \delta_{\text{о}} + \delta_{\text{упр}}} \cdot 100\%. \quad (8)$$

Since the total deformation of the molding sand is divided into viscous, elastic and plastic deformations, their effect on the explosive compaction can be estimated the following way:

$$\Delta\delta_{\text{вяз}} + \Delta\delta_{\text{пл}} + \Delta\delta_{\text{упр}} = 1. \quad (9)$$

During the compaction process, these parameters interchange, while their total sum is constant. Initially, the elastic properties of the molding sand are the most distinct; the effect of the plastic properties is observed to a lesser extent; the elastic properties are slightly observed. During the first phase, acceleration, the elastic properties of the molding sand remain minimal; the viscous properties recede gradually to 50…60 %; and plastic properties enhance to 40…50 %. When the maximum strain rate is gained, during the short period of the uniform motion, the viscous properties of the sand reach their minimum, while the plastic properties increase to the maximum. During the final phase of the compaction, deceleration, viscous properties start enhancing and increase up to 80…90 %, while plastic properties recede almost to zero (figure 3). Elastic properties slightly increase almost linearly during the whole process.

Results. The properties of the molding sand have been studied in [15-21]. Study [15] is chronologically one of the first that introduce the effect of dynamics of the compaction process on the sand properties. It has revealed that with an increase in strain rate of molding sand layers its viscosity decreases, while other properties have not been examined. Study [16], as well as [17], has examined the restricted model of a viscoelastoplastic body; both works have mentioned the change in properties during the compaction process. Models [18-21] have revealed the change in viscous, elastic and plastic properties and this data correlate with our data in general. Nevertheless, they also do not take the motion character of the sand under explosive loading, i.e. the three phases, into account. The increase in viscosity during the compaction process, which has been revealed in the present study, has not been determined so clearly in these models.

Proceeding from the above, there are following recommendations:

1. When using dynamic compaction methods, the low-viscosity molding sands should be used.
2. The molding sand for the specific parameters can be chosen according to its strain rate.

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ТҰТҚЫР-СЕРПІМДІ-ПЛАСТИКАЛЫҚ ҚАЛЫПТАУ ҚОСПАСЫН ЖАРЫЛУ ТОЛҚЫНЫНЫҢ ИМПУЛЬСІМЕН ТЫҒЫЗДАУ

Аннотация. Мақалада құм-балшықты қалып қоспасын жанғыш газ жарылысы импульсінің әсерімен тығыздау процесі қарастырылады. Тәжірибелер қалыптау жартылай автоматты құрылғы негізінде жасалған эксперименттік қондырғы арқылы орындалды. Қалып қоспасы тығыздығының импульс қуаты мен қоспаның физика-механикалық қасиеттеріне байланысы анықталынған. Жарылу қысымының толқыны опокадағы қоспа бағанасын белсендендіреді. Қоспа қабаттары жоғарысынан бастап астына дейін біртіндеп бірізділік қозғалысқа келеді. Әрбір қабат басында үдейді, сосын бірқалыпты қозғалады, тежеледі және тоқтайды. Бұл сәтте қоспа кинетикалық энергиясы арқылы тығыздалады. Қалып қоспасының екпіндету жылдамдығы неғұрлым жоғарырақ болса, ие болған кинетикалық энергиясы және тығыздау кезінде пайда болған кернеулер соғұрлым көбірек болады.

Қоспаны қозғалысқа келтіру үшін оның тыныштық инерциясын жеңу қажет. Сөйтіп, жүктеменің қоспа қабатына әсер етуі өте қысқа болуымен, қоспа қабаты өз инерциясының арқасында қысым толқыны өткен соң ғана қозғала бастайды. Демек, тығыздау процесі жүктемеге еруге үлгермейді, яғни қалып қоспасының

деформациялануы жүктемеден кешігіп қалады. Қоспа неғұрлым борпылдақтау болса, ол соғұрлым қаттырақ жылдамдатылады. Тығыздығы аз қоспаның бөлшектері арасындағы түйіспе байланыстарының тығыздығы көбірек қоспа бөлшектерінікінен әлсіздеу және де оңайырақ үзіледі. Сол себепті қалып қоспасының деформациясы басталуының жүктеме импульсінен кешігу мерзімі қысқарады, ал деформация мөлшері мен деформация жылдамдығы артады. Сондай-ақ кешігу уақыты түйіспе байланыстарының беріктігіне және қалып қоспасының физика-механикалық қасиеттеріне тәуелді. Қалып қоспасы бөлшектерінің арасындағы байланыстар негізінен балшықты байланыстырғыштың қабыршағымен қамтамасыз етіледі. Оның басым қасиеті – тұтқырлық. Сондықтан тұтқырлық импульсті тығыздау процесіне едәуір әсер етеді деп болжауға болады.

Құм-балшықты қоспаның жылжымылығы да оның физика-механикалық қасиеттеріне, бірінші кезекте, тұтқырлығына байланысты. Жарылыспен қалыптау кезінде қалып қоспасы тұтқырлығының тығыздалмай қалу дәрежесіне әсерін зерттеу мақсатымен тұтқырлықты технологиялық анықтау әдісі ойлап табылды. Оның мәні қоспадағы пайда болған сығу кернеулерін бірдей етіп, қалып қоспасы сынамасын жарылыспен және жаншумен тығыздаған соң, қалдық деформацияларын (демек, тығыздықтар) салыстыруға байланысты. Қалып қоспасы тұтқырлығының қоспаның тығыздалмай қалу дәрежесіне әсерін есепке алу үшін келесі қатынас ұсынады:

$$\Delta\varepsilon_{\text{вяз}} = \frac{\varepsilon_{\text{стат}} - \varepsilon_{\text{дин}}}{\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}}},$$

мұндағы $(\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}})$ – қалып қоспасының толық деформациясы; $\Delta\varepsilon_{\text{вяз}}$ – тұтқырлықтың қалып қоспасының жалпы деформациясына әсер етуін сипаттайтын шама; $\varepsilon_{\text{стат}}$ – қалып қоспасының статикалық жаншудан кейінгі қалдық деформациясы; $\varepsilon_{\text{дин}}$ – қалып қоспасының жарылыспен тығыздаудан кейінгі қалдық деформациясы; $\varepsilon_{\text{упр}}$ – қалып қоспасының серпімді деформациясы.

Тәсілді іске асыру үшін конструкциясы бірегей аспап жасалды. Оның жәрдемімен тығыздау процесі барысында қоспаның тұтқыр, серпімді және пластикалық қасиеттері өзгеруінің сипаты анықталды. Тығыздау процесінде олардың мәні қайта бөлінеді, бірақ жалпы сомасы өзгермейді. Үдету кезенінде қоспа ең азсерпімді қасиетін көрсетеді, тұтқырлық қасиеті төмендейді, ал пластикалық қасиеті жоғарылайды. Бірқалыпты қозғалған кезінде, тұтқыр қасиеті минималды және пластикалық қасиеті максималды болады. Одан әрі процес аяқталғанға дейін тұтқыр қасиеті 80...90 %-ға дейін көбейеді, ал пластикалық қасиеті іс жүзінде нөлге дейін кемиді. Серпімді қасиеті процесс бойы дерлік түзу сызықты болады, бірақ аздап өсе береді.

Түйін сөздер: қалып қоспасы, тығыздау процесі, импульс, тұтқырлық, серпімділік.

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УПЛОТНЕНИЕ ВЯЗКО-УПРУГО-ПЛАСТИЧЕСКОЙ ФОРМОВОЧНОЙ СМЕСИ ИМПУЛЬСОМ ВЗРЫВНОЙ ВОЛНЫ

Аннотация. В статье рассматривается процесс уплотнения песчано-глинистой формовочной смеси воздействием импульса взрыва горючего газа. Опыты проводились на экспериментальной установке, созданной на базе формовочного полуавтомата. Установлена зависимость плотности литейной формы от мощности импульса и физико-механических свойств смеси. Волна взрывного давления приводит в движение столб смеси в опоке. Перемещение смеси происходит последовательными слоями. Каждый слой вначале разгоняет-ся, затем движется равномерно, тормозится и потом останавливается. При этом происходит уплотнение слоя за счет кинетической энергии движения. Чем больше скорость разгона формовочной смеси, тем больше приобретаемая ею кинетическая энергия и, соответственно, напряжение сжатия, возникающее при уплотнении.

Чтобы привести смесь в движение, надо преодолеть ее инерцию покоя. Поэтому при кратковременном действии нагружения слой смеси, благодаря своей инерции, начинает движение, когда волна давления уже прошла через нее. Таким образом, процесс уплотнения не успевает следовать за нагрузкой, т.е. происходит запаздывание деформации формовочной смеси от нагружения. Более рыхлая смесь разгоняется сильнее, чем более плотная. Контактные связи между частицами малоплотной смеси слабее, чем связи между частицами более плотной смеси и разрушаются легче. Поэтому время запаздывания между началом деформации формовочной смеси и импульсом нагружения уменьшается, а деформация и скорость деформации увеличиваются. Причем время запаздывания зависит от прочности контактных связей и физико-механических свойств

формовочной смеси. Межчастичные связи формовочной смеси обеспечиваются в основном пленкой глинистого связующего. А преобладающим ее свойством является вязкость. Логично предположить, что вязкость оказывает существенное влияние на процесс импульсного уплотнения.

Подвижность песчано-глинистой смеси также зависит от ее физико-механических свойств, в первую очередь вязкости. Для изучения влияния вязкости формовочной смеси на степень недоуплотнения при взрывной формовке был разработан способ технологического определения вязкости. Он заключается в сравнении остаточных деформаций (и, как следствие, плотностей) образца формовочной смеси после уплотнения взрывом и прессованием при одинаковых напряжениях сжатия, возникающих в смеси. Для подсчета влияния вязкости формовочной смеси на степень ее недоуплотнения предлагается соотношение:

$$\Delta\varepsilon_{\text{вяз}} = \frac{\varepsilon_{\text{стат}} - \varepsilon_{\text{дин}}}{\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}}},$$

где $(\varepsilon_{\text{стат}} + \varepsilon_{\text{упр}})$ – полная деформация формовочной смеси; $\Delta\varepsilon_{\text{вяз}}$ – величина, характеризующая влияние вязкости на общую деформацию формовочной смеси; $\varepsilon_{\text{стат}}$ – остаточная деформация формовочной смеси после статического прессования; $\varepsilon_{\text{дин}}$ – остаточная деформация формовочной смеси после уплотнения взрывом; $\varepsilon_{\text{упр}}$ – упругая деформация формовочной смеси.

Для реализации способа был разработан прибор оригинальной конструкции. С его помощью установлен характер изменения вязких, упругих и пластических свойств смеси в течение процесса. В процессе уплотнения происходит перераспределение их значений, но их общая сумма остается неизменной. На стадии разгона смесь обладает минимальными упругими свойствами, проявление вязких свойств снижается, а пластических возрастает. При равномерном движении вязкие свойства минимальны, а пластические – максимальны. Далее до окончания процесса вязких свойства возрастают до 80...90 %, а пластические уменьшаются практически до нуля. Упругие свойства возрастают почти линейно в течение всего процесса, но незначительно.

Ключевые слова: формовочная смесь, процесс уплотнения, импульс, вязкость, упругость.

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RESULTS OF EXPERIMENTAL RESEARCH OF HYDRODYNAMICS OF A STATIONARY LAYER DURING FILTRATION DRYING OF RAW COTTON

Abstract. This article presents the results of experimental researches of the hydrodynamics of a stationary layer during filtration drying of raw cotton. At the same time, the total energy consumption for the process of filtration drying consists of pressure losses in the stationary layer and heating of the heat agent to a predetermined temperature. For this, it is important to establish the dependence of pressure losses in a stationary layer of wet cotton fiber on the fictitious filtration rate of the heat agent, as an important factor determining the intensity and economic efficiency of filtration drying. All experiments were carried out with appropriate hangings of cotton fiber, taking into account that the natural moisture content of cotton fiber is insignificant. Experimental studies have been conducted on filtering a thermal agent through a conditionally stationary layer of cotton fiber with different weights were performed in the form of a functional dependence $\Delta P = f(v_0)$. The results of comparing the ratio of experimentally determined values of pressure losses in a conditionally stationary layer of cotton fiber to those theoretically calculated as a function of the Reynolds number are presented. The absolute value of the relative error does not exceed 14.2%, which is explained by the complex structure and spontaneity of the formation of a stationary layer of cotton fiber, as well as the impact of the pressure drop on the height of the layer.

Key words: cotton fiber, hydrodynamics, filtration drying, hydraulic resistance, porosity, active specific surface area of the layer.

Introduction. It is known [1,2] that cotton is used for the production of cotton wool and various types of fabrics for industrial and household purposes, in particular chintzes, satin, batiste, cord for automobile tires and the like. Cotton fibers are widely used in new, non-traditional areas applications, such as reinforcing composites, geotextiles, personal absorption products and biomedical materials [3-7]. Therefore, the modernization of cotton processing and high-quality storage is extremely important for the development of the economy of Kazakhstan [8,9].

Currently in cotton processing plants when using drying drums of the type 2SB-10, SBT, SBU deteriorates the properties of raw materials. As a result of subsequent technological processes, the fiber grade is reduced by 25% through mechanical action, a lot of energy is spent, the color of the fiber is lost and there is also twisting of the fiber and the fiber microstructure deteriorates [10]. Drying drums used for drying raw cotton, as well as equipment and methods for drying food product and vegetative raw material [11-13], do not provide more efficient and high-quality drying of fibers, its moisture content should be between 8-9% [10].

Considering that the intensity of heat and mass transfer determines the speed of movement of the heat agent relative to the elements of the porous layer, this work presents the results of experimental researches of pressure losses in the cotton fiber layer from the point of view of the internal hydrodynamic problem during filtration drying of cotton. This method of drying can not only ensure the preservation of high quality raw cotton, but also reduce the energy costs of the primary processing process [14].

Experimental part and description of the installation. All experiments were carried out with the appropriate hangings of cotton fiber. Considering that the natural moisture content of cotton fiber is insignificant ($0.08 - 0.12\ kg\ H_2O/kg\ dry.mat.$) and the moisture is mostly related, at the temperature of the gas stream T=293 K and relative air moisture $\varphi = 60\%$ its evaporation will also be insignificant (the time of the experiment was 90 – 120 s, the sample mass loss during the experiment was less than 0,2%), therefore the effect of moisture evaporation on pressure loss was not taken into account.

Experimental studies of the hydrodynamics of a stationary layer of cotton fiber were carried out on an experimental installation, shown in figure 2, according to the method given in the works [14,15].

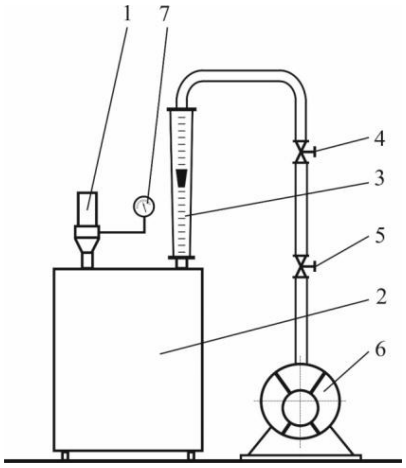


Figure 1 – Diagram of an experimental installation for researching the hydrodynamics of a conditionally stationary layer of cotton fiber:
1 – experimental capacity;
2 – receiver;
3 – rotameter;
4, 5 – control and shut-off valve;
6 – the vacuum pump;
7 – vacuum meter.

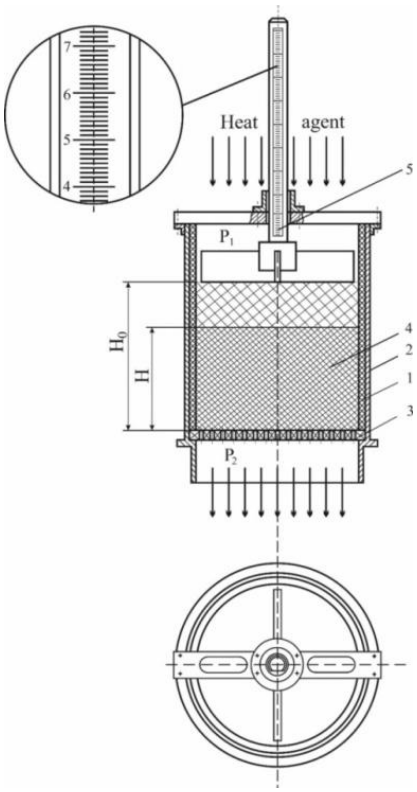


Figure 2 – Scheme of the experimental capacity:
1 – the basis of the experimental capacity;
2 – thermal insulation insert;
3 – the perforated partition;
4 – a layer of cotton fibers;
5 – gauge;
H_0 – initial height of the cotton fiber hitch;
H – the current height of the cotton fiber during the changing of pressure drop.

The experimental installation consists of a container 1 that is installed on the receiver 2, and with the help of a system of pipelines and a rotameter 3, 4 shut-off and regulating 5 valves is connected to a circulating vacuum pump 6. The rarefaction created by the vacuum pump in the receiver and under the material layer is measured by a vacuum meter 7.

The experimental tanks are presented in figure 3. The base of the container 1 is made of duralumin, and the cylindrical insert 2 and the perforated partition 3 are made of thermal insulation material (fluoroplast). In the center of the container is a measuring ruler 5, which makes it possible to determine the height of a conditionally stationary layer of cotton fiber 4 during the changes in the pressure drop.

In the experimental capacity 1, the appropriate cotton fiber suspension was loaded and installed on the receiver 2. Included a vacuum pump 6 and with the help of a control valve 5 different air flow rates were set through the cotton fiber layer. The flow rate was determined by the readings of the rotameter 3, pressure loss according to the vacuum meter 7 a change in the height of the cotton fiber layer using a measuring ruler. The number of measurements was 8 to 10 points, and each experiment was performed at

least three times until stable data was obtained. For each experiment was taken a fresh load of cotton. The weight of each cotton hitch was determined using the AXSIS-3000 electronic weight with an accuracy of 0.01g. The initial volume density for each experiment of the same weight of the hitch was the same.

The initial data for conducting experimental researches are shown in the table.

Characteristics of the cotton fiber layer [16]

Weight of the hitch G_v, kg	Porosity ε_0	Surface area F, m^2	The height of the fiber layer H_v, m
0.010	0.990	3.448	0.00101
0.015	0.987	5.172	0.00151
0.020	0.986	6.897	0.00201
0.025	0.984	8.621	0.00252
0.030	0.981	10.345	0.00302
0.060	0.966	20.689	0.00604
0.080	0.955	27.586	0.00806
0.110	0.942	37.931	0.01108

Discussion and checking the adequacy of results. Experimental researches on filtration of a heat agent through a conditionally stationary layer of cotton fiber with different weights were performed the functional dependence ΔP=f(v_0) is shown in figure 3 (a).

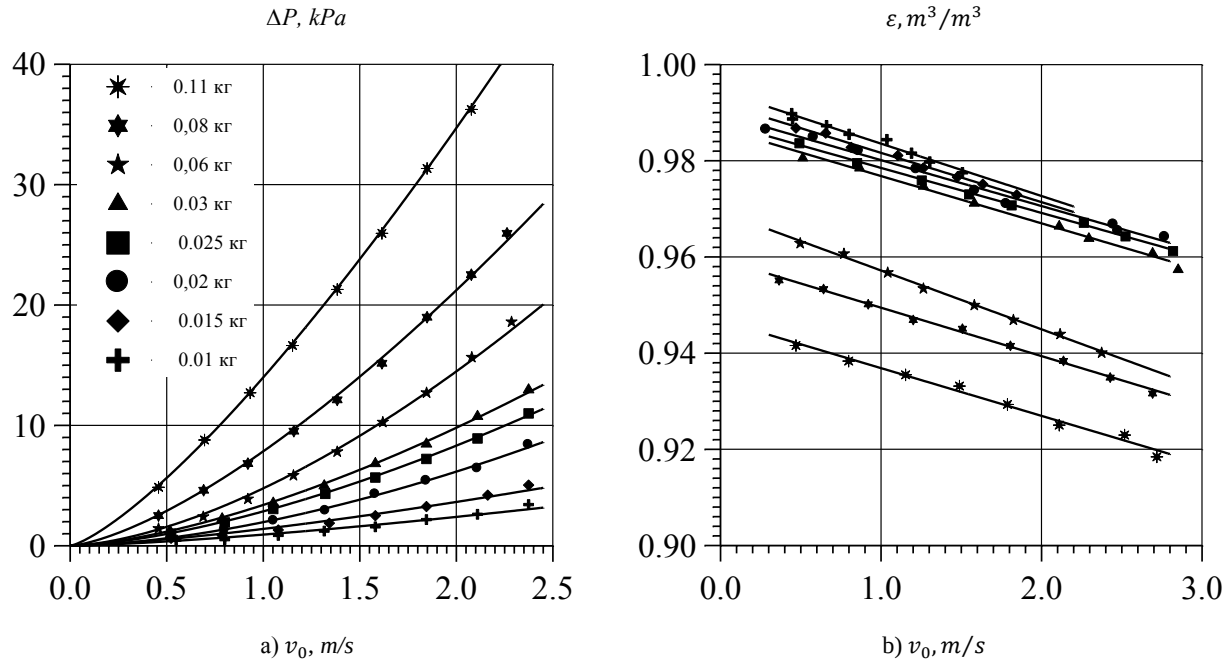
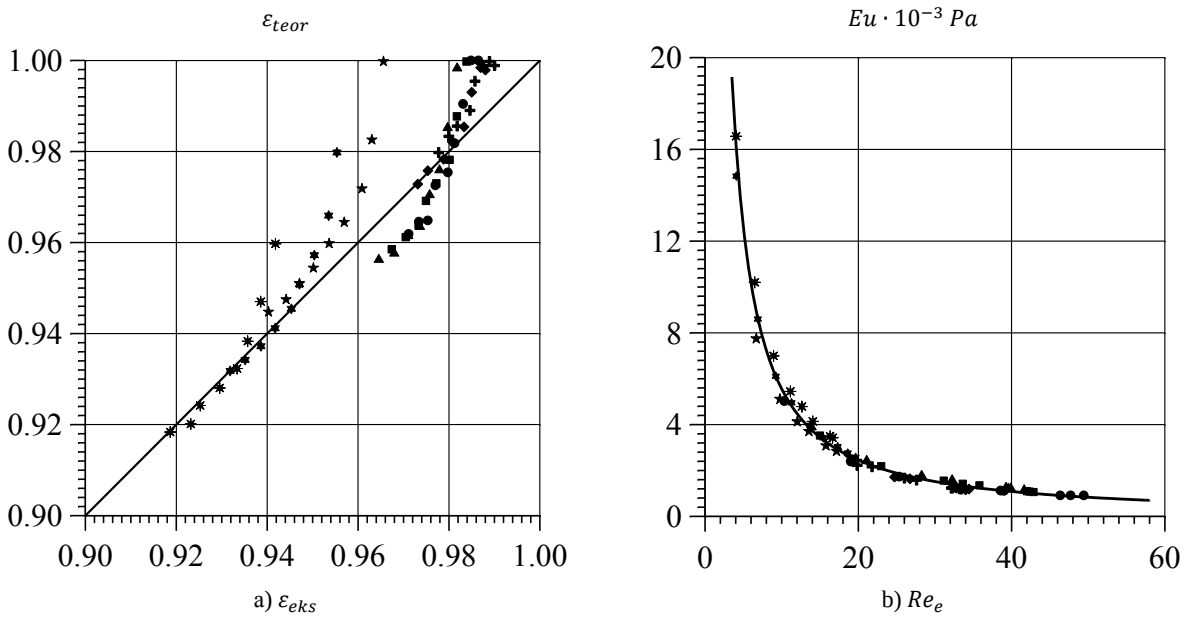


Figure 3 – Results of experimental researches: a) dependence of pressure losses in a conditionally stationary layer of cotton fiber on the fictitious filtration rate of the heat agent; b) dependence of the porosity of the cotton fiber layer on the fictitious filtration rate of the heat agent

Analysis of figure 3 (a) shows that the curves have a parabolic character, that is, the pressure loss in a conditionally stationary layer of cotton fiber is affected by both the viscous and inertial components. Figure 3 (b) shows a change in the porosity of the cotton fiber layer with a change in the fictitious filtration rate of the heat agent $\varepsilon = f(v_0)$.



a) ε_{eks} b) Re_e

Figure 4 – Comparison of experimental and theoretically calculated dependencies (the designation corresponds to figure 3): a) comparison of experimental and theoretically calculated on the dependence (1) values of porosity of a conditionally stationary layer of cotton fiber; b) dependence of the Euler number on the Reynolds number.

Approximation of experimental information by a power function allowed us to receive the following calculated dependence:

$$\varepsilon = \varepsilon_0 \cdot v_0^{-0.025} \tag{1}$$

The results of comparison of experimental data on the porosity of a conditionally stationary layer of cotton fiber with theoretically calculated ones based on the dependence (1) are shown in figure 4 (a).

As can be seen from figure 4 (a), the absolute value of the maximum relative error between the experimental data and the theoretically calculated data does not exceed 5.6%.

Generalization of experimental data (in figure 3 (a)), on the hydrodynamics of filtering a thermal agent through a stationary layer of cotton was carried out in the form of dimensionless complexes $Eu = f(Re_e)$ (in figure 4 (a)), and dependence of the hydraulic resistance coefficient of the layer $\xi = f(Re_e)$as functions of the Reynolds number (in figure 5 (b)).

Approximation of the experimental data shown in figure 4 (b) by a power function allowed us to obtain the following calculated dependence:

$$\mathrm{Eu} = 84000 \cdot \mathrm{Re_e^{-1.18}}, \tag{2}$$

where $\mathrm{Re_e}$ – is the equivalent value of the Reynolds number.

$$\mathrm{Re_e} = \frac{\mathrm{v \cdot d_e \cdot \rho}}{\mu},$$

where μ – is coefficient of dynamic viscosity of the gas flow, $Pa \cdot s$;

The coefficient of hydraulic resistance of the cotton fiber layer was calculated based on the experimental data shown in figure 3 (a) from the equation [17,18]:

$$\Delta P = \xi \cdot \frac{\rho \cdot v^2}{2} = \xi \cdot \frac{\rho \cdot v_0^2}{2 \cdot \varepsilon_l^2} \tag{3}$$

where ξ – is the coefficient of hydraulic resistance of the porous layer $\xi = \lambda_l \cdot \frac{(a+b) \cdot H_v}{2 \cdot a \cdot b \cdot \varepsilon_l}$; v_0– fictitious heat agent filtration rate $v_0 = v \cdot \varepsilon,\ m/c$; ε_l – is the porosity of the layer, m^3 / m^3; a and b– the middle width and thickness of the cotton lint, respectively, m; H_v –is the height of the fiber layer with density ρ_v, m.

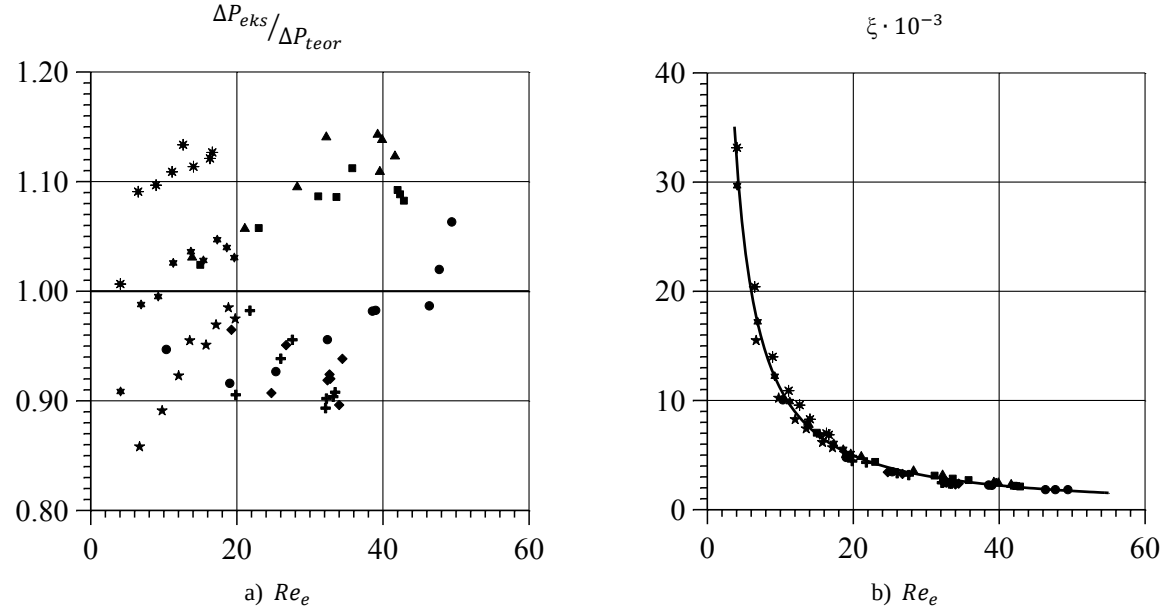


Figure 5 – Comparison of experimental and theoretically calculated dependencies (the designation corresponds to figure 3): a) - comparison of experimental and theoretically calculated on the dependence (2) of pressure losses in a conditionally stationary layer of cotton fiber b) - dependence of the coefficient of hydraulic resistance of cotton fiber on the Reynolds number

Approximation of experimental information shown in figure 5 (b) by a power function allowed us to receive the following calculated dependence [19,20]:

$$\xi = 160000 \cdot Re_e^{-1.16} \quad (4)$$

Comparing the proportion of experimentally determined values of pressure losses in a conditionally stationary layer of cotton fiber to those theoretically calculated based on the dependence (2) on the Reynolds number shown in figure 5 (a). The absolute value of the relative error does not exceed 14.2%, which is explained by the complex structure and spontaneity of the formation of a stationary layer of cotton fiber, as well as the impact of the pressure drop on the height of the layer.

Conclusions. One of the high-intensity methods of removing both free and bound moisture is filtration drying. This is due to the fact that during drying, the filtration heat agent is filtered through the porous structure of the wet material, which is placed on the perforated partition in the direction "wet material - perforated partition". The speed of movement of the heat agent in the pores and channels of a stationary layer of wet material determines the thickness of the boundary layer (hydrodynamic, thermal and diffusion) and accordingly, the values of the heat coefficients and mass transfer. Besides that, the surface of heat and mass transfer is the total surface of the pores and channels through which the heat agent is filtered. The filtration rate of the heat agent is determined based on technical and economic considerations, taking into account that its increase affects the growth of pressure loss. Moreover, the actual speed of movement of the heat agent relative to the layer elements is significantly higher than in the case of drying by any other methods (in boiling layer, during drying in pneumatic transport dryers, etc). Large heat and mass transfer surfaces and the speed of the heat agent in the pores and channels of the stationary layer of wet material provide high coefficients of heat and mass transfer and accordingly, the intensity of filtration drying.

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ШИТТІ МАҚТАНЫ СҮЗІП КЕПТІРУ КЕЗІНДЕ СТАЦИОНАРЛЫҚ ҚАБАТТЫҢ ГИДРОДИНАМИКАСЫН ЭКСПЕРИМЕНТТІК ЗЕРТТЕУ НӘТИЖЕЛЕРІ

Аннотация. Мақта талшығы армирлеуші композит, геотекстиль, жеке абсорбция құралдары және биомедициналық материалдар сияқты жаңа, дәстүрлі емес қолдану салаларында кеңінен пайдаланылады. Сондықтан мақтаны қайта өңдеуді жаңғырту және сапалы сақтау Қазақстан экономикасын дамыту үшін өте маңызды. Қазіргі уақытта мақта өңдеу зауыттарында кептіру барабанын пайдалану барысында шикізат қасиеттері нашарлайды. Келесі технологиялық үдерістер нәтижесінде талшықтың сорттылығы механикалық әсер ету арқылы 25% - ға төмендейді: артық энергия жұмсалады, талшық түсі жоғалады әрі бұралады, талшықтың микроқұрылымы нашарлайды.

Жылу мен масса алмасудың қарқыны кеуекті қабаттың элементтеріне қатысты жылу агентінің қозғалыс жылдамдығын анықтайтынын ескере отырып, аталған зерттеу жұмысында мақтаны сүзіп кептіру барасында гидродинамиканың ішкі міндеті тұрғысынан мақта талшығының қабатындағы қысым шығынын тәжірибелік зерттеу нәтижесі ұсынылған. Мұндай кептіру әдісі шитті мақтаның жоғары сапасын сақтауды қамтамасыз етумен қатар, бастапқы өңдеу үдерісінің энергетикалық шығынын да төмендетуі мүмкін. Сонымен бірге Сүзгіш Кептіру үдерісіне жұмсалатын энергия шығыны тұрақты қабаттағы қысымның жоғалу уақытынан жылу агентін берілген температураға дейін қыздырады. Бұл үшін мақтаның ылғалды талшық қабатындағы тұрақты қысымның жоғалып кету жағдайының фильтрациялық кептірудің қарқыны мен экономикалық тиімділігін анықтайтын маңызды фактор ретінде жылу агентін сүзгілеудің фиктивті жылдамдығына тәуелділігін анықтау маңызды болып саналады. Мақта талшығының табиғи ылғалының мардымсыздығын ескере отырып, эксперимент мақта талшығын өлшеу барысында жүргізілді.

Тәуелділікті талдау мақта талшығының шартты стационарлық қабатындағы қысымның жоғалуына Тұтқыр және инерциялық құрамдастың әсерін айқындады. Жылу агентін сүзудің фиктивті жылдамдығын ауыстыра отырып, мақта талшығы қабатындағы кеуектің өзгеру үдерісі көрсетілген. Ылғалды материалдың стационарлық қабатының тесігі мен каналындағы жылу агентінің қозғалыс жылдамдығы шекаралық қабат қалыңдығын және тиісінше жылу және масайналым коэффициенттерінің мәнін анықтайды. Сонымен қатар, жылу және масса алмасу беті жылу агенті сүзетін тесіктер мен каналдардың жиынтық беті болып саналады. Жылу агентін сүзу жылдамдығы оның ұлғаюы қысымның жоғалуына әсер ететінін ескере отырып, техникалық-экономикалық пайымдарға сүйене отырып анықталады. Бұл ретте, қабат элементтеріне қатысты жылу агентінің нақты қозғалыс жылдамдығы кез келген басқа әдістермен (қайнаған қабатта, пневмокөлік кептіргішінде кептіру кезінде және т.б.) кептіру жағдайына қарағанда айтарлықтай жоғары. Жылу және масса алмасудың үлкен беті және ылғалды материалдың стационарлық қабатының тесігі мен каналдарындағы жылу агентінің жылдамдығы жылу және масса қайтарудың жоғары коэффициентін және тиісінше Сүзгіш кептірудің қарқындылығын қамтамасыз етеді.

Рейнольдс санына байланысты теориялық есептелген мақта талшығының шартты стационарлық қабатындағы қысымның тәжірибелік мәнінің қатынасын салыстыру нәтижесі келтірілген. Салыстырмалы қателіктің абсолюттік мәні 14,2%-дан аспайды, бұл жағдай мақта талшығының стационарлық қабатының қалыптасуының күрделі құрылымы, стихиялығы, сондай-ақ қабат биіктігіне қысым ауытқуының әсері негізінде түсіндіріледі.

Түйін сөздер: мақта талшығы, гидродинамика, сүзіп кептіру, гидравликалық кедергі, кеуектілік, қабаттың белсенді беткі қабаты.

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РЕЗУЛЬТАТЫ ЭКСПЕРИМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ ГИДРОДИНАМИКИ СТАЦИОНАРНОГО СЛОЯ ПРИ ФИЛЬТРАЦИОННОЙ СУШКЕ ХЛОПКА-СЫРЦА

Аннотация. Волокна хлопка широко используются в новых, нетрадиционных областях применения, таких как армирующие композиты, геотекстиль, средства индивидуальной абсорбции и биомедицинские материалы. Поэтому модернизация переработки хлопка и качественное хранение имеет чрезвычайно важное значение для развития экономики Казахстана. В настоящее время на хлопкоперерабатывающих заводах при использовании сушильных барабанов ухудшаются свойства сырья. В результате последующих технологических процессов сортность волокна снижается на 25% через механическое воздействие, тратится много энергии, теряется цвет волокна, а также происходит скручивание волокна, ухудшается микроструктура волокна.

Учитывая то, что интенсивность тепло- и массообмена определяет скорость движения теплового агента относительно элементов пористого слоя, в данной работе представлены результаты экспериментальных исследований потерь давления в слое волокна хлопка с точки зрения внутренней задачи гидродинамики при фильтрационной сушке хлопка. Такой метод сушки может не только обеспечить сохранение высокого качества хлопка сырца, но и снизить энергетические расходы процесса первичной переработки. Вместе с этим суммарные затраты энергии на процесс фильтрационной сушки состоят из потерь давления в стационарном слое и нагрева теплового агента до заданной температуры. Для этого важно установить зависимость потерь давления в стационарном слое влажного волокна хлопка от фиктивной скорости фильтрации теплового агента, как важного фактора определяющего интенсивность и экономическую эффективность фильтрационной сушки. Все эксперименты проводили при соответствующих навесках волокна хлопка, учитывая то, что естественное влагосодержание волокна хлопка является незначительным.

Анализ зависимостей показывает, что на потери давления в условно стационарном слое волокна хлопка влияют как вязкостная, так и инерционная составляющие. Приведено изменение порозности слоя волокна хлопка со сменой фиктивной скорости фильтрации теплового агента. Скорость движения теплового агента в порах и каналах стационарного слоя влажного материала определяет толщину пограничного слоя и соответственно значения коэффициентов тепло- и массоотдачи. Кроме этого, поверхностью тепло- и массообмена является суммарная поверхность пор и каналов, сквозь которые фильтруется тепловой агент. Скорость фильтрации теплового агента определяют исходя из технико-экономических соображений, учитывая то, что ее увеличение влияет на рост потери давления. Причем, действительная скорость движения теплового агента относительно элементов слоя значительно выше, чем в случае сушки любыми другими методами (в кипящем слое, во время сушки в пневмотранспортных сушилках и др). Большие поверхности тепло- и массообмена и скорость теплового агента в порах и каналах стационарного слоя влажного материала обеспечивают высокие коэффициенты тепло- и массоотдачи и соответственно интенсивность фильтрационной сушки.

Приведены результаты сравнения отношения экспериментально определенных значений потерь давления в условно стационарном слое волокна хлопка к теоретически рассчитанным в зависимости от числа Рейнольдса. Абсолютное значение относительной погрешности не превышает 14,2%, что объясняется сложной структурой и стихийностью формирования стационарного слоя волокна хлопка, а также воздействием перепада давления на высоту слоя.

Ключевые слова: волокно хлопка, гидродинамика, фильтрационная сушка, гидравлическое сопротивление, пористость, активная удельная поверхность слоя.

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DIAGNOSTIC VALUE OF PELVIC FLOOR ULTRASONOGRAPHY FOR DIAGNOSIS OF PELVIC ORGAN PROLAPSE

Abstract. Female pelvic floor dysfunction encompasses a number of prevalent clinical conditions, including female pelvic organ prolapse, urinary and fecal incontinence, obstructed defecation, and sexual dysfunction. Pelvic Organ Prolapse (POP) is the hidden epidemic. In the USA it has been conservatively estimated that the prevalence of symptomatic POP will increase by 46% to reach 4.9 million women by 2050. POP is a major public health issue that will continue to grow in developed countries due to the aging populations.

Prolapse development is multifactorial, with vaginal child birth, advancing age, and increasing body-mass index as the most consistent risk factors.

The integrated lifespan model presented by De Lancey describes predisposing and inciting causal factors for the development of POP where childbirth is considered an important inciting factor.

Patients generally present with several complaints, including bladder, bowel, and pelvic symptoms; however, with the exception of vaginal bulging, none is specific to prolapse.

Women with symptoms suggestive of prolapse should undergo a pelvic examination. Physical exam (PE) remains the primary modality to evaluate POP, but clinical examination alone is not enough diagnosing pelvic floor dysfunction. The International Continence Society Pelvic Organ Prolapse Quantification (ICS POP-Q) system provides information on surface anatomy only and gives no information on underlying organs or functional anatomy. It can lead to underestimate or misdiagnose the site, degree, and nature of visceral prolapse of pelvic organ prolapse in 45–90% of patients and caused result in incorrect treatment and recurrence of symptoms in 10–30% of patients after surgery.

The diagnosis of prolapse of the posterior vaginal compartment, which gynecologists call posterior vaginal wall descent a ‘rectocele’, this appearance may be caused by at least five distinct anatomical conditions which are difficult to distinguish without imaging. These include true radiological rectocele, perineal hypermobility, enterocele, rectoenterocele, and rectal intussusception. Imaging can identify conditions that mimic cystocele, such as urethral diverticula or Gartner cysts, and also can show two types of cystoceles with different functional implications.

Therefore, we are needed additional diagnostic tools to make qualified decisions on conservative or surgical treatment. Transperineal sonography is the least invasive, cheapest, simplest, and most commonly available method for pelvic floor imaging. In addition, it has tremendous potential to be used as a research tool in trying to understand the pathophysiology of POP.

Childbirth is significantly associated with develop by urinary incontinence(UI) and POP. Levator avulsion is the traumatic disconnection of the puborectalis component of the levator ani from the os pubis. Levator avulsion injury may occur during vaginal delivery, and forceps delivery carries a higher risk of trauma to the pelvic floor muscles than vacuum and normal vaginal delivery. Childbirth-related morphological abnormalities or defects of the puborectalis muscle (“avulsion”) can be diagnosed not only by three-dimensional (3D) ultrasound but by 2D translabial ultrasound too. Enlarges the levator hiatus (LH), levator-urethra gap (LUG) as measured by 3-dimensional transperineal tomographic ultrasound are also associated with development of POP.

Thus, transperineal ultrasound is one of the most reliable and effective methods for diagnosing pelvic floor injuries and dysfunction.

Key words: pelvic organ prolapse, transperineal ultrasound, levator ani.

Pelvic organ prolapse (POP) has a deleterious impact on the quality of life for a large proportion of women worldwide, with a reported prevalence ranging from 2.9 to 50%, depending on definitions and population groups [1].

Pelvic Organ Prolapse (POP) is the hidden epidemic. In the USA it has been conservatively estimated that the prevalence of symptomatic POP will increase by 46% to reach 4.9 million women by 2050. Hence, POP is a major public health issue that will continue to grow in developed countries due to the aging populations [2].

Each year, approximately 300,000 women require surgery for POP and stress urinary incontinence. The direct cost of prolapse surgery is greater than $1 billion per year [3].

Pregnancy and delivery are considered major risk factors in the development of POP and stress urinary incontinence (SUI). To date, pelvic organ support is generally quantified by clinical examination using the International Continence Society Pelvic Organ Prolapse Quantification (ICS POP-Q) system [4].

The ICS POP-Q was introduced in 1996 with an aim of standardizing assessment. Although ICS POP-Q is widely used, the staging system derived from POP-Q is based on expert opinion rather than data.

The system provides information on surface anatomy only and gives no information on underlying organs or functional anatomy. Staging of bladder, uterine, small bowel and rectal descent are identical under the quantification system, i.e. a uterus that descends to within 1 cm of the hymen is deemed to be as abnormal as the descent of the anterior or posterior vaginal wall in the same level [5].

Furthermore, the ICS POP-Q system uses a moving structure, the hymen, as the reference point to quantify pelvic organ descent, which may not be optimal for this purpose. Most importantly, almost 20 years after the introduction of this assessment system, it still lacks a definition of ‘normal’.

Significant POP is generally defined as ICS POP-Q stage 2 or above [6], and it is only very recently that information on the limits of ‘normality’ have become available [5,7].

As anatomy does not always correlate with urinary and bowel symptoms, additional diagnostic tools are needed to make qualified decisions on conservative or surgical treatment. For example, the diagnosis of prolapse of the posterior vaginal compartment, which is common in women with symptoms of prolapse and obstructed defecation: gynecologists call posterior vaginal wall descent a ‘rectocele’, but this appearance may be caused by at least five distinct anatomical conditions which are difficult to distinguish without imaging. These include true radiological rectocele, perineal hypermobility, enterocele, rectoenterocele, and rectal intussusception [8,9].

Transperineal ultrasound is a new alternative for the investigation of the functional anatomy of the pelvic floor, and cut-offs have been suggested to define clinically relevant descent of the urinary bladder, cervix, and rectum in relation to the sensation of a vaginal bulge [10].

Ingrid Volloyhaug at al. studied correlation between pelvic organ prolapse quantification (POP-Q) and ultrasound measurement prolapse in women from a normal population and tried to identify the method with a stronger association with prolapse symptoms. 590 parous women were examined using POP-Q and transperineal ultrasound and correlation was tested using Spearman’s rank test. The scientists concluded that POP-Q and ultrasound measurement of prolapse had moderate to strong correlation in the anterior and middle compartments and weak correlation in the posterior compartment. POP-Q had a stronger association than ultrasound with the symptom “vaginal bulge” [11].

Dietz et al. compared the results of the clinical examination and imaging findings. They retrospectively examined 825 women. All women were carried out a local standardized interview with symptoms of prolapse, the clinical examination included ICS POP-Q assessment and 4D translabial ultrasound. The authors concluded that US and clinical measures of prolapse have a near- linear relationship and found weaker agreement for all compartments (anterior 75%), the middle 69%, and posterior 63%) than in the Ingrid Volloyhaug at al.’s study [12].

The levator hiatus is the space bounded by the puborectalis component of the levator ani muscle and the os pubis. It is the largest potential hernia portal of the human body, so its dimensions matter for pelvic organ support, as does the integrity of the muscle that defines the hiatus [13].

Levator hiatal area of > 25 cm2 on Valsalva as measured by 3D translabial pelvic floor ultrasound examination suggest that can consider as abnormal distensibility or ‘ballooning’ of the levator hiatus [14].

Levator avulsion is the traumatic disconnection of the puborectalis component of the levator ani from the os pubis. Levator avulsion injury may occur during vaginal delivery, and forceps delivery carries a higher risk of trauma to the pelvic floor muscles than vacuum and normal vaginal delivery [15,16,17].

Childbirth-related morphological abnormalities or defects of the puborectalis muscle ("avulsion") can be diagnosed not only by magnetic resonance imaging and three-dimensional (3D) ultrasound but by 2D translabial ultrasound too. H. P. Dietz and K. L. Shek examined seventy-five women for major morphological abnormalities of the puborectalis muscle by palpation, 2D and 3D ultrasound (US). They concluded that the finding of a discontinuity between the hyperechogenic muscle and the pelvic sidewall is moderately reproducible and agrees moderately well with palpation and 3D US [18].

Lieming Wen at al. used Z scores to quantify hiatal distensibility and tested the performance of Z scores for levator hiatal areas in predicting substantial pelvic organ prolapse. They undertook a retrospective study of the data from 145 nulliparous and 166 patients with POP who had a clinical POP examination with 3-dimensional translabial ultrasonography. The authors defined a Z-Av value of less than 1.0 as a "normal hiatal expansion," 1 to 3 as "mild ballooning," 3 to 5 as "moderate ballooning," 5 to 7 as "marked ballooning," and 7 or greater as "severe ballooning". Their findings were based on a sample of patients that was limited to a population of Chinese women. The applicability of the Z score is possible in specific populations whose normality curves are known, so the need to create specific population curves for clinical applicability [19].

Bence Kozma at al. evaluated the association between pelvic organ prolapse (POP) types and levator-urethra gap (LUG) as measured by 3-dimensional transperineal tomographic ultrasound. A retrospective studied was carried out on 98 women with symptomatic POP. Abnormal LUG of 25mm or greater indicated levator avulsion. The researchers concluded that bilateral levator ani avulsion as diagnosed by LUG measurements of 25mm or greater at rest is associated with multicompartment, severe prolapse [20-21].

Avulsion in turn enlarges the hiatus [22], results in anterior and central compartment prolapse [23] and reduces pelvic floor muscle function by about one-third [24].

Imaging can identify conditions that mimic cystocele, such as urethral diverticula or Gartner cysts, and also can show two types of cystoceles with different functional implications. Eisenberg V. H. at al. determined the prevalence of levator ani injury in patients with different types of cystocele. They were evaluated 222 women presenting with symptoms of lower urinary tract and pelvic floor dysfunction. All patients were conducted a physical examination, urodynamic testing and four-dimensional (4D) pelvic floor ultrasound. The authors concluded, that a cystourethrocele is associated with good urine flow rates and urodynamic stress incontinence, while a cystocele with intact retrovesical angle is associated with voiding dysfunction and a low likelihood of stress incontinence. All women with Green type III cystocele had a levator injury on the tomographic ultrasound imaging. The researchers suggested, that a cystocele with an intact retrovesical angle associated with avulsion injury of the levator ani muscle, caused by birth-related trauma. This data contradicts the commonly held belief that such cystoceles are caused by central rather than by lateral fascial defects [25].

A proper diagnosis is a precondition for appropriate management of any clinical condition. For this aim, transperineal ultrasound offers a unique opportunity for diagnosing reliably pelvic floor injuries and dysfunction with a huge potential for improving women's health by detecting preventable risk factors for these lesions, by encouraging early pelvic floor rehabilitation for women with asymptomatic lesions.

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ЖАМБАС ОРГАНДАРЫНЫҢ ПРОЛАПС ДИАГНОСТИКАСЫНДАҒЫ ТРАНСПЕРИНЕАЛДЫҚ УЛЬТРАДЫБЫСТЫҚ ЗЕРТТЕУДІҢ ДИАГНОСТИКАЛЫҚ ҚҰНДЫЛЫҒЫ

Аннотация. Әйел жамбасының қуыс түбінің жеткіліксіздігі бірқатар жалпы клиникалық жағдайды, соның ішінде, әйелдің жамбас мүшелерінің пролапсы (ЖМП), зәр мен нәжіс ұстамау, дефекация қиындығы мен жыныстық дисфункцияны қамтиды. ЖМП – жасырын індет. Америка Құрама Штаттарында, қарапайым есеп бойынша, симптоматикалық ЖМП таралуы 2050 жылға қарай 46%-ға артып, 4,9 млн. әйелге жетеді.

ЖМП даму қаупінің негізгі себептері – қынаптық босану, егде жастағы адам және дене салмағының индексін арттыру. DeLancey et al ұсынылған ЖМП дамуының бейімді және бастамашы факторын сипаттайтын интеграцияланған өмір сүру ұзақтығы моделі бойынша босану маңызды, қоздырушы фактор саналады.

Физиологиялық тексеру ЖМП бағалаудың негізгі әдісі болғанымен, жамбастың қуыс түбінің дәрменсіздігін диагностикалау үшін бірреттік клиникалық тексеру жеткіліксіз. ICS POP-Q анатомиялық пролапсты сандық анықтау үшін қолданылады және емдеу мүшесінің функционалдық анатомиясы туралы ешқандай ақпарат бермейді. Мұндай тәсіл емделушілердің 45-90% жуығында дұрыс бағаланбауға немесе қате топикалық диагностикаға әкелуі мүмкін, сол себепті дұрыс емделмейді және операциядан кейінгі пациенттердің 10-30%-да симптом қайталанады.

Қынаптың артқы қабырғасының түсу диагнозы пролапс симптомы және дефекация обструкциясы бар әйелде жиі кездеседі: гинекологтар қынаптың артқы қабырғасының төмен түсуін «ректоцеле» деп атайды, бірақ бұл анықтама визуалдау әдісінсіз ажырату қиын болатын, аз дегенде, бес түрлі анатомиялық жай-күйден тууы мүмкін.

Оларға рентгенологиялық ректоцеле, қасағаның гипермобильділігі, энтероцеле, сигмоидоцеле және тік ішектің инвагинациясы жатады. Визуалдау әдістері цистоцеле имитациялайтын жай-күйді уретра дивертикулы немесе Гартнер кистасы сияқты цистоцеле түрлерін түрлі функционалдық жай-күй негізінде саралауы мүмкін.

Жоғарыда айтылғандарды ескерсек, консервативті немесе хирургиялық емдеуге қатысты ұтымды шешім қабылдау үшін қосымша диагностикалық әдістерді қолдану қажеттілігі айқын.

Трансперинеалдық сонография – инвазивті емес, арзан, қарапайым және кең таралған жамбас түбін визуалдау әдісі. Сонымен қатар, ол ЖМП патофизиологиясын түсіну үшін зерттеу құралы ретінде пайдалану барысында зор әлеуетке ие.

Босану едәуір дәрежеде стрестік зәрдің тоқтамауы мен ЖМП дамуына себеп болады. Леваторлық авульсия (үзілу) дегеніміз – құлпынай сүйегінен LAM пуборектальді компонентін травматикалық ажырату. Акушерлік қысқышты салу арқылы босандыру ұрықтың вакуум-экстракциясына және қынап туытына қарағанда Lam жарақатының даму қаупін жоғарылатады. Пуборектальды бұлшықеттің морфологиялық ауытқу немесе кемшілігін тек үшөлшемді (3D) УДЗ көмегі арқылы ғана емес, 2D трансперинеальді ультрадыбысты қолдану негізінде де диагностикалауға болады. Үшөлшемді трансперинеалдық томографиялық УДЗ көмегі арқылы өлшенетін леватор тесігінің (LH) және леватор-уретральды кесіндісінің (LUG) ұлғаюына, ЖМП дамуына байланысты.

Осылайша, трансперинеалды УДЗ – жамбастың қуысы түбінің зақымдануын және дисфункциясын диагностикалаудың берік және тиімді әдісінің бірі.

Түйін сөздер: жамбас мүшелерінің пролапсы, трансперинеалды ультрадыбыстық зерттеу.

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ДИАГНОСТИЧЕСКАЯ ЦЕННОСТЬ ТРАНСПЕРИНЕАЛЬНОГО УЛЬТРАЗВУКОВОГО ИССЛЕДОВАНИЯ В ДИАГНОСТИКЕ ПРОЛАПСА ТАЗОВЫХ ОРГАНОВ

Аннотация. Недостаточность тазового дна у женщин охватывает ряд распространенных клинических состояний, включая пролапс тазовых органов (ПТО), недержание мочи и кала, затрудненную дефекацию и сексуальную дисфункцию. ПТО является скрытой эпидемией. В США, по самым скромным подсчетам, распространенность симптоматического ПТО увеличится на 46% и достигнет 4,9 миллиона женщин к 2050 году. ПТО является основной проблемой здравоохранения, которая может охватить и развитые страны, в которых идет процесс старения населения.

Основными факторами риска развитие ПТО являются влагалищные роды, пожилой возраст и увеличение индекса массы тела.

Интегрированная модель продолжительности жизни, представленная DeLancey et al., описывает предрасполагающие и инициирующие факторы развития ПТО, где роды считаются важным провоцирующим фактором.

Физикальное обследование остается основным методом оценки ПТО, но одного клинического обследования недостаточно для диагностики несостоятельности тазового дна. ICS POP-Q используется для

количественного определения анатомического пролапса и не дает никакой информации о функциональной анатомии пролабирующего органа. Такой подход приводит к недооценке тяжести заболевания или к неправильной топической диагностике у 45–90% пациентов, что, в свою очередь, становится результатом неправильного лечения и возникновения рецидиву симптомов у 10–30% пациентов после операции.

Диагноз выпадения задней стенки влагалища часто встречается у женщин с симптомами пролапса и обструкции дефекации: гинекологи называют опущение задней стенки влагалища «ректоцеле», но это определение может быть вызвано как минимум пятью различными анатомическими состояниями, которые трудно различить без методов визуализации. К ним относятся рентгенологический ректоцеле, гипермобильность промежности, энтероцеле, сигмоидоцеле и инвагинация прямой кишки. Методы визуализации могут идентифицировать состояния, которые имитируют цистоцеле – такие, как дивертикулы уретры или кисты Гартнера, а также могут дифференцировать типы цистоцеле с различными функциональными состояниями.

Исходя из вышеизложенного, становится очевидной необходимость применения дополнительных диагностических методов для принятия квалифицированных решений относительно консервативного или хирургического лечения.

Трансперинеальная сонография является неинвазивным, недорогим, простым и наиболее распространенным методом визуализации тазового дна. Кроме того, она обладает огромным потенциалом для использования в качестве инструмента исследования в попытке понять патофизиологию ПТО.

Роды в значительной степени связаны с развитием стрессового недержания мочи и ПТО. Леваторная авульсия (отрыв) – это травматическое отсоединение пубо-ректального компонента LAM от лонной кости. Родоразрешение с наложением акушерских щипцов имеет более высокий риск развития травм LAM, чем вакуум-экстракция плода и влагалищные роды. Морфологические аномалии или дефекты пубо-ректальной мышцы можно диагностировать не только с помощью трехмерного (3D) УЗИ, но и с применением 2D трансперинеального ультразвука. Увеличение леваторного отверстия(LH) и леваторно-уретрального отрезка (LUG), которые измеряются с помощью трехмерного трансперинеального томографического УЗИ, также связаны с развитием ПТО.

Таким образом, трансперинеальное УЗИ является одним из надежных и эффективных методов диагностики повреждений и дисфункции тазового дна.

Ключевые слова: пролапс тазовых органов, трансперинеальное ультразвуковое исследование, леватор ани.

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IDENTIFICATION OF KAZAKH HORSES BY MICROSATELITE DNA USING MODERN ANALYTICAL METHODS

Abstract. Results of population and genetic structure on 17 microsatellite (MS) DNA loci of horses of the Aday breed bred in the Republic of Kazakhstan are presented. The number of the general population (samples) was 33 animals.

Modern Kazakhstan population of the Kazakh horses of the Aday offspring is characterized by the following population and genetic indicators: an average number of alleles (N) –7.17, the average heterozygosity (expected He) –0.8226, average heterozygosity (expected, Ho) – 0.9180, the individual index of fixing (Fis) – 0.1171. 122 alleles were identified, of them 122 informative alleles (with a frequency more than 0.01), private - 0 (with a frequency less than 0.01) and effective - 99.29.

Key words: Kazakh horse, Aday offspring, genetic variability, inbreeding, heterozygosity, microsatellites.

Introduction. The Aday offspring of the Kazakh horses type is distributed in Caspian Depression in the western Kazakhstan (Mangystau Region) [1,2,3].

Assessment of a genetic diversity is an integral part of selective and breeding work and the analysis of inter - and intrapopulation polymorphism of loci of DNA began to be performed taking into account regional placement of a domestic population of the Kazakh horses of the Aday offspring.

One of the most informative methods of such analysis is microsatellite (MS) typing which not only characterizes genetic structure of populations, breeds, herds, and evaluates degree of their genetic similarity, but also increases efficiency of selection by control of origin authenticity [4-6].

The aim of this work is an assessment of the current state of population and genetic structure of the Kazakh horses of the Aday offspring by polymorphism of microsatellite DNA loci.

Materials and methods of research. As material there were biological samples (hair follicles) of 33 animals from Taushyk LLP, Tupkaragan district of the Mangystau Region. Collecting biomaterials was carried out in 2019.

DNA extraction was carried out according to the protocol of the reagents' manufacturer (Invitrogen, Applied Biosystems, USA). Multiplex genotyping of horses was conducted by the Stock Marks Horse set (Applied Biosystems, USA) according to 17 loci recommended by the International Society for Animal Genetics (ISAG).

Identification of amplification products was executed using the genetic ABI Seq Studio analyzer (Applied Biosystems, USA) with a capillary electrophoresis. Interpretation of the received graphic results was carried out in the Gene Mapper 5.0 program.

For describing polymorphism, the following indicators were used: allele frequency, the average observed and expected heterozygosity as well as the average heterozygosity on loci, number of alleles in a locus, number of informative alleles (frequent, with more than 1% frequency), number private alleles (rare, with less than 1% frequency) in a locus, number of effective alleles and the individual index of fixing Fis.

All biometric calculations were carried out according to the standard technique of variation statistics [7-9]. For calculation of population and genetic indicators, statistics package [10] and Fortran Power Stationv.2.0 software program complex in algorithmic language of proprietary development were used [11].

Allelic profiles. Alleles frequency of occurrence, a minimum, a maximum and an average number of alleles, alleles frequencies, a number of informative alleles, a number of effective alleles, private alleles number and frequencies of occurrence were determined.

Allele frequencies were calculated separately for each locus according to a formula:

$$p_i = \frac{N_p}{2N}, \quad (1)$$

where *Pi* – the i-th allele frequency of occurrence, *Np* – quantity of the i-th allele, in sampling, *2N* – number of animals in sampling.

The number of informative alleles was calculated as number of alleles in population with a frequency of occurrence more than 1%.

The number of effective alleles, i.e. number of the alleles meeting with equal frequency in ideal population which is necessary for receiving the same degree of homozygosity or a genetic variety in real population, were calculated by a formula:

$$Ne = \frac{1}{1-He}, \quad (2)$$

where Ne – a number of effective alleles in population, He – an average expected heterozygosity degree.

The number of private alleles was calculated as number of alleles in population with a frequency of occurrence no more than 1%.

Average observed degree of heterozygosity (Ho) was calculated for each locus as the ratio of number of heterozygotes to total number of the studied animals. For calculation of Ho of an individual it was found an arithmetic average Ho value on all studied 17 loci.

The average expected degree of heterozygosity (He) was calculated for each locus, using the following formula:

$$H_e = 1 - \sum_i p_i^2, \quad (3)$$

where pi – the frequency of occurrence of the i-th allele. For calculation of He of an individual it was found an arithmetic average He value on all studied 17 loci.

The individual index of fixing (Fis) is a coefficient at individuals in relation to subpopulation, it serves as a measure of decrease in level of heterozygosity of an individual owing to nonrandom pairing in each subpopulation. For calculation a formula was used:

$$\text{Fis} = (\text{He} - \text{Ho}) / \text{He}, \quad (5)$$

Results and discussion. *All-breeds (population) differentiation.* Characteristic of Aday offspring of the Kazakh horse is presented in the context of population and genetic breed differentiation with the use of modern analytical methods of identification by microsatellite DNA. Modern analytical methods of identification are widely practiced in many biological investigations [12]. For a total characteristic and positioning of this breed the following results of genotyping of 17 microsatellite loci are given in table in details.

The revealed allelic options of MS loci of of the Aday offspring of the Kazakh Jabe horse (the number of samples - 33 animals)

MS Locus	N	Na	Npr	Ne	He	Ho	Fis
VHL20	9	9	0	7	0.8629	1	-0.15888
HTG4	7	7	0	5	0.7786	0.7878788	-0.01192
AHT4	7	7	0	5	0.7963	0.8181818	-0.02748
HMS7	4	4	0	4	0.7235	0.9393939	-0.2984
HTG6	8	8	0	8	0.8695	0.9090909	-0.04553
AHT5	8	8	0	6	0.8312	0.9090909	-0.09371
HMS6	7	7	0	6	0.8392	0.8787879	-0.04717
ASB23	8	8	0	6	0.8384	1	-0.19275
ASB2	7	7	0	6	0.8424	0.9090909	-0.07917
HTG10	9	9	0	7	0.8522	1	-0.17343
HTG7	8	8	0	5	0.8065	0.8787879	-0.08963
HMS3	7	7	0	6	0.8182	0.9090909	-0.11109
HMS2	6	6	0	6	0.8182	0.8484848	-0.03701
ASB17	8	8	0	7	0.8462	0.8484848	-0.0027
LEX3	6	6	0	5	0.7907	0.969697	-0.22638
HMS1	5	5	0	5	0.8121	1	-0.23138
CA425	8	8	0	7	0.8587	1	-0.16455
Total	122	122	0	99.289	13.9848	15.606061	-1.99118
Average value	7.1761	7.1764	0	5.8405	0.8226353	0.9180036	-0.11713

Note: N– number of alleles, Na – number of informative alleles (Na≥1%), Npr – number of private alleles (Npr<0.1%), Ne – number of effective alleles, He – the average expected geterezigosity, Ho – the average observed geterezigosity, and Fis - the individual index of fixing.

In general, the carried-out analysis of an allele fond of this samples of the Aday offspring Kazakh horse type revealed the range of values distinctive only for Aday spawn. The most polymorphic for this offspring of the Kazakh horses of 17 MS loci are VHL 20, HTG10, HTG6, AHT5, ASB 23, HTG 7, ASB 17, Ca425 with 9 and 8 alleles respectively, least polymorphic are loci HMS7 and HMS1 (with 4 and 5 alleles). A genetic intra breeding variety (polymorphism) reflects existence of informative, effective alleles and presence of rare (private) alleles. In total 122 alleles were identified, among them informative - 122, effective – 99.23 and private – 0. The average allele number on all loci was 7.17, on all informative alleles –7.17, on effective – 5.84 and on private – 0, it is specified in figure 1. The lack of private alleles demonstrates the consolidated status of the Kazakh horses of the Aday offspring.

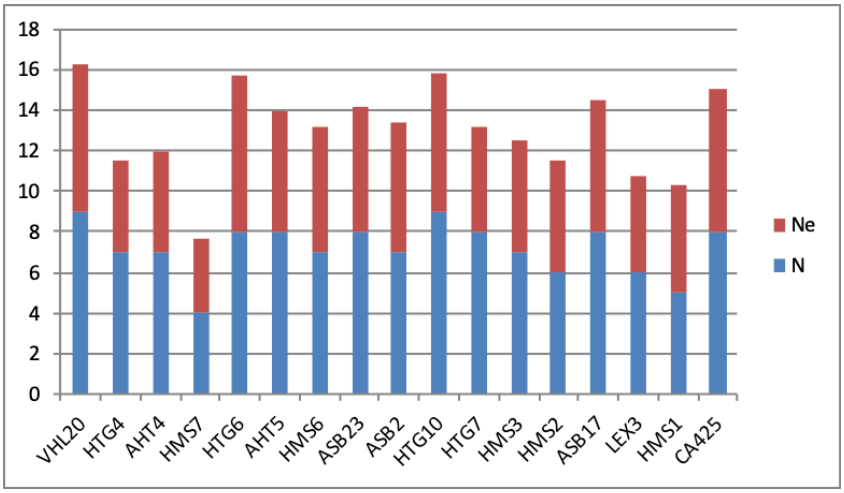

Figure 1 – A share of informative and effective alleles in 17 MS loci of the Kazakh horses type of the Aday offspring. The dark colour specifies a share of informative alleles, the light one - a share of effective alleles

Level of the average expected heterozygosity of horses in loci varies from 0.7235 (in HMS7 locus) to 0.8695 (in HTG6), the average value on all loci is 0.8226. This regularity is observed also in levels of average observed heterozygosity as it is specified in figure 2.

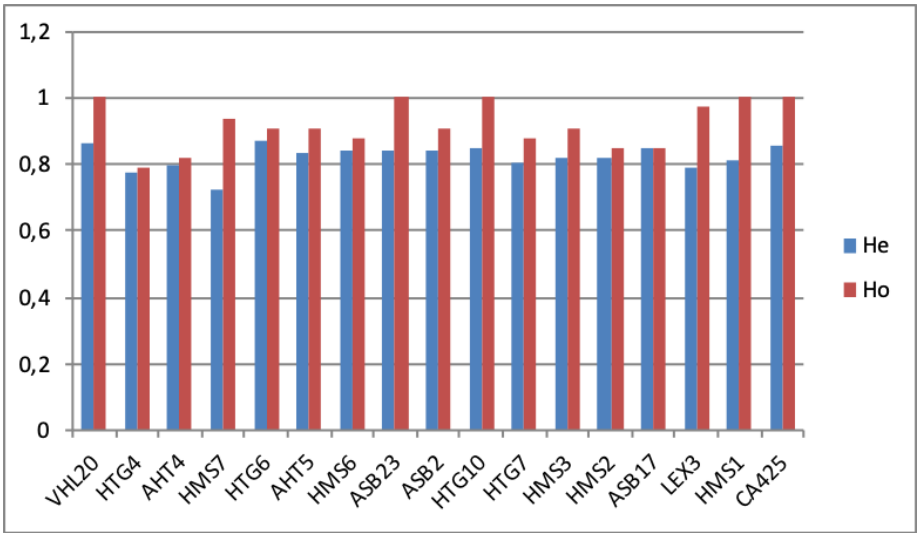

Figure 2 – A share of informative and effective alleles in 17 MS loci of the Kazakh horses of the Aday offspring. The dark colour specifies a share of informative alleles, the light one - a share of effective alleles

One of the indicators of population differentiation, Fis coefficient (the individual index of fixing), showed the surplus of heterozygotes in all loci as shown in figure 3.

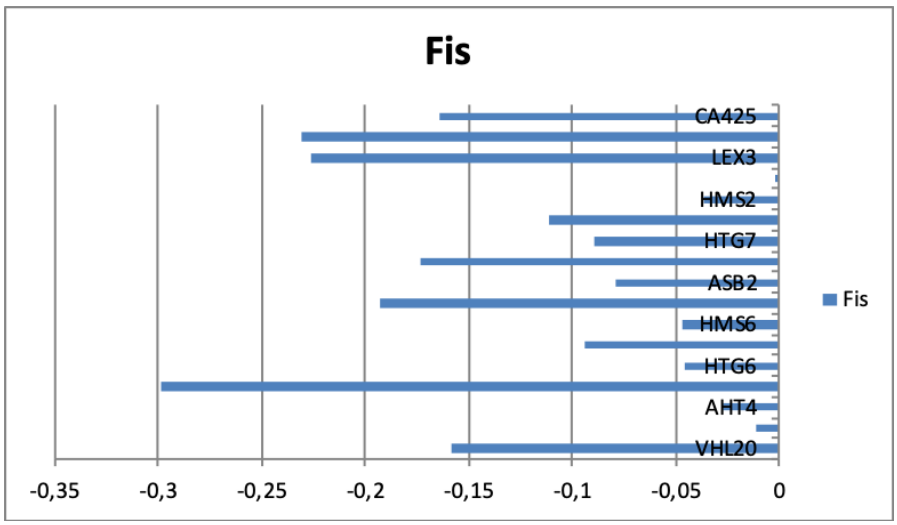

Figure 3 – Fis Coefficient (the individual index of fixing) of 17 MS loci of the Kazakh horses of the Aday offspring

Conclusion. The population and genetic structure of the Aday breed of horses shows differentiation of population in common. The total number of the alleles found in 17 microsatellite loci is 122, of them informative alleles - 122, effective alleles – 99.28 and private alleles - 0. Indicators of the level of the average expected heterozygosity vary from 0.7235 to 0.8695. As for Fis coefficient (the individual index of fixing), the surplus heterozygosity in all loci was found. The expected heterozygosity He = 0.8677, the observed heterozygosity Ho =0.8600.

The analysis of the studied parameters of population and genetic structure of the Aday offspring of the Kazakh horses confirmed an existence of intrapopulation differentiation of animals in the conditions of the Mangyshlak peninsula.

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ҚАЗАҚ ЖЫЛҚЫЛАРЫН ҚАЗІРГІ ЗАМАНҒЫ АНАЛИТИКАЛЫҚ ТӘСІЛДЕРМЕН МИКРОСАТИЛЕТТІ ДНҚ БОЙЫНША ИДЕНТИФИКАЦИЯЛАУ

Аннотация. Генетикалық алуан түрлілікті бағалау селекциялық – асылдандыру жұмыстарының ажырамас бөлігі болып саналады және днқ локустарының аралық және ішкі популяциялық полиморфизмінің есебі отандық қазақ жылқылары адай тармағының жергілікті популяциясын ескеру отырып жүргізілді.

Бұл тәсілдердің мәліметті көп алуға мүмкіндік беретін талдауының бірі микросателлетті типтеу (МС) болып саналады. Бұл тәсіл популяция, түр, табынның генетитикалық құрылымын сипаттап қана қоймай, олардың генетикалық ұқсастық дәрежесін бағалайды, сонымен қатар шығу-тегін бақылау арқылы селекция тиімділігін жоғарылатады.

Жұмыс мақсаты – микросателлитті ДНҚ локустарының полиморфизмі бойынша қазақ жылқылары адай тармағының популяциялық генетикалық құрылымының қазіргі жағдайын бағалау.

Биологиялық үлгілер (шаш қылы) 33 бас жануардан Маңғыстау облысы Түпқараған ауданының «Таушық шаруашылығы» ЖШС-нен алынды. Биоматериалдарды жинау 2019 жылы іске асты.

ДНҚ-ны бөліп алу реагенттер өндірушісі (Invitrogen, Applied Biosystems, АҚШ) нұсқаулығына сәйкес жүргізілді. Жылқыларды генетиптеуді Stock Marks Horse (Applied Biosystems, АҚШ) 17 локус жинағымен ауылшаруашылық жануарларының халықаралық генетиктер ISAG (International Society for Animal Genetics) нұсқаулығы негізінде іске асырды.

Амплификация өнімдерін идентификациялау ABI Seq Studio (Applied Biosystems, АҚШ) генетикалық анализаторда капиллярлы электофорезді қолдану негізінде жүзеге асырылды. Алынған графикалық нәтижелердің ажыратылуы GeneMapper 5.0. бағдарламасымен жүргізілді.

Қазақстан Республикасы аумағында өсірілетін адай жылқыларының 17 микросатиллетті (МС) ДНҚ локусы бойынша популяциялық-генетикалық құрылым нәтижелері берілді. Жалпы популяция көлемі 33 басты құрады.

Жалпылай алғанда, қазақ жылқылары адай тармағының аталған аллелофонд жүргізілген талдауы тек адай тармағына тән мән спектрін анықтады. Қазақ жылқылары аталған тармағының полиморфтылығының көбісі 17 МС локустарынан VHL20, HTG10, HTG6, AHT5, ASB23, HTG7, ASB17, CA425c локустары сәйкесінше 9 және 8 аллелі, полиморфтылығы азы – HMS7 және HMS1 локустары (4 және 5 аллельден). Түрішілік генетикалық алуантүрлілік (полиморфтылық) ақпараттық, тиімді және сирек аллельдің бар екендігін байқатады. Жалпы 122 аллель идентификацияланды, ақпараттық – 122, тиімдісі – 99.23 және сирегі – 0. Барлық локустар бойынша аллельдердің орташа саны 7.17 құрады, барлық ақпараттық аллельдер – 7.17, тиімдісі – 5.84 және 1-суретте көрсетілгендей сирегі – 0. Сирек аллельдердің жоқтығы адай тармағы қазақ жылқылары статусының шоғырланғандығын айқындайды.

Локустар бойынша жылқылардың күтілетін орташа гетерозиготтылық дәрежесі 0.7235-ден (HMS7 локуста) 0.8695 (HTG6) дейін, барлық локустар бойынша орташа көрсеткіш 0.8226 көрсетті. Аталған заңдылық орташа гетерозиготтылық деңгейіне қатысты байқалады.

Адай жылқыларының популяциялық-генетикалық құрылымы жалпы популяция дифференциясын көрсетеді. 17 микросатиллетті локустарда анықталған аллелдердің жалпы мөлшері 122, оның 122 ақпараттық, тиімдісі – 99.28 және сирегі – 0 аллель. Күтілетін гетерозиготтықтың орташа дәреже көрсеткіші – 0.7235-ден 0.86950 дейін. *Fis* коэффициенті бойынша (фиксацияның жекелеген индексі), барлық локустарда гетрезиготтардың көп мөлшері анықталды. Күтілетін гетерозиготтық – *He* = 0.8677, байқалатын гетерозиготтық – *Ho* = 0.8600.

Қазақ жылқысы адай тармағының популяционды-генетикалық зерттеу параметрлерін талдау Маңғышлақ түбегіндегі жануарларда популяцияішілік дифференцияның бар екендігін айқындайды.

Осылайша қазақ адай тармағы жылқысы келесідей популяциялық-генетикалық көрсеткіштер арқылы сипатталады: аллельдердің орташа саны – (*N*) – 7.17, орташа гетерозиготтылық (күтілетін, *He*) – 0.8226, орташа гетерозиготтылық (байқалатын, *Ho*) – 0.9180, фиксацияның жекелеген индексі (*Fis*) – 0.1171.

122 аллель идентификацияланды, оның ақпараттық аллелдері – 122 (жиілігі 0,01), сирегі – 0 (жиілігі 0,01 төмен) және тиімдісі – 99.29.

Түйін сөздер: қазақ жылқысы, адай тармағы, генетикалық өзгергіштік, инбридинг, гетерозиготтық, микросателлиттер.

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ИДЕНТИФИКАЦИЯ КАЗАХСКИХ ЛОШАДЕЙ СОВРЕМЕННЫМИ АНАЛИТИЧЕСКИМИ МЕТОДАМИ ПО МИКРОСАТЕЛЛИТНЫМ ДНК

Аннотация. Оценка генетического разнообразия является неотъемлемой частью селекционно-племенной работы и анализ меж- и внутрипопуляционного полиморфизма локусов ДНК стал проводиться с учетом регионального размещения отечественной популяции казахских лошадей адайского отродья.

Одним из наиболее информативных методов такого анализа является микросателлитное (МС) типирование, которое не только характеризует генетическую структуру популяций, пород, стад и оценивает степень их генетического сходства, но и повышает эффективность селекции путем контроля за достоверностью происхождения

Цель данной работы – оценка современного состояния популяционно-генетической структуры адайского отродья казахских лошадей по полиморфизму микросателлитных локусов ДНК.

Материалом служили биологические образцы (волосяные луковицы) 33 голов животных из ТОО «Таушык» Тупкараганского района Мангистауской области. Сбор биоматериалов осуществлялся в 2019 году.

Выделение ДНК проводилось в соответствии с протоколом производителя реагентов (Invitrogen, Applied Biosystems, США). Мультиплексное генотипирование лошадей проводили набором Stock Marks Horse (Applied Biosystems, США) по 17 локусам, рекомендованным международным обществом генетики сельскохозяйственных животных ISAG (International Society for Animal Genetics).

Идентификация продуктов амплификации выполнена на генетическом анализаторе ABISeqStudio (Applied Biosystems, США) с применением капиллярного электрофореза. Расшифровка полученных графических результатов проводилась в программе GeneMapper 5.0.

Представлены результаты популяционно-генетической структуры по 17 микросателлитным (МС) локусам ДНК лошадей адайской породы, разводимой в Республике Казахстан. Размер общей популяции (выборки) составил 33 голов.

В целом, проведенный анализ аллелофонда данной выборки адайского отродья казахской лошади выявил спектр значений, характерный только для адайского отродья. Наиболее полиморфными для данного отродья казахских лошадей из 17МС локусов являются локусыVHL20, HTG10, HTG6, AHT5, ASB23, HTG7, ASB17, CA425с 9 и 8 аллелями соответственно, наименее полиморфны локусы HMS7 и HMS1 (по 4 и по 5 аллелей). Генетическое внутрипородное разнообразие (полиморфность) отражает наличие информативных, эффективных аллелей и присутствие редких (приватных) аллелей. Всего было идентифицировано 122 аллелей, из них информативных- 122, эффективных –99.23 и приватных – 0. Среднее число аллелей по всем локусам составило 7.17, по всем информативным аллелям –7.17, по эффективным –5.84 и по приватным – 0 как указано на рисунке 1. Отсутствие приватных аллелей свидетельствует о консолидированном статусе казахских лошадей адайского отродья.

Уровень средней ожидаемой гетерозиготности лошадей по локусам варьирует от 0.7235 (в локусе HMS7) до 0.8695 (HTG6), средний показатель по всем локусам составляет 0.8226. Данная закономерность наблюдается и для уровней средней наблюдаемой гетерозиготности.

Популяционно-генетическая структура адайской *породы лошадей* показывает дифференциацию популяции в целом. Общее количество аллелей, обнаруженных в 17 микросателлитных локусах, составило122, из них информативные аллели – 122, эффективные аллели – 99.28 и приватные аллели – 0. Показатели уровня средней ожидаемой гетерезиготности варьируют от 0.7235 до 0.8695. По коэффициенту

Fis (индивидуальный индекс фиксации), был обнаружен избыток гетрезигот во всех локусах. Ожидаемая гетерезиготность *He* = 0.8677, наблюдаемая гетерезиготность *Ho* = 0.8600.

Анализ исследуемых параметров популяционно-генетической структуры адайского отродья казахских лошадей подтвердил наличие внутрипопуляционной дифференциации животных в условиях полуострова Мангышлак.

Таким образом, современная казахстанская популяция казахских лошадей адайского отродья характеризуется следующими популяционно-генетическими показателями: среднее число аллелей (*N*) – 7.17, средняя гетерозиготность (ожидаемая, *He*) – 0.8226, средняя гетерозиготность (наблюдаемая, *Ho*) – 0.9180, индекс фиксации индивидуальный (*Fis*) – 0.1171. Было идентифицировано 122 аллелей, из них информативных аллелей 122 (с частотой более 0,01), приватных- 0 (с частотой менее 0,01) и эффективных – 99.29.

Ключевые слова: казахская лошадь, адайское отродье, генетическая изменчивость, инбридинг, гетерозиготность, микросателлиты.

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STUDY OF THE EFFICIENCY OF NATURAL ANTIOXIDANTS IN STORING POULTRY RAW MATERIAL PROCESSING

Abstract. The efficiency of using dihydroquercetin as an antioxidant, which increases the duration of storage of poultry processing raw materials, is investigated.

A comparative assessment of the effectiveness of the natural antioxidants of vitamins E, C, rutin, and dihydroquercetin was carried out for the duration of storage of minced meat from the fillet, meat of deboned meat and skin from broiler carcasses. The introduction of antioxidants in the experimental samples of raw materials ensured, during 28 days of storage, a lower value of the indicators of oxidative spoilage: the acid number by an average of 74%, and the peroxide number by 1.5-1.7 times, relative to these indicators in the control sample antioxidants.

The use of dihydroquercetin in experimental samples of frozen mechanically deboned meat for long-term storage, in the studied concentrations, ensured after 1 month of storage a lower value of the oxidative spoilage indicators: the acid number was 2–10% lower, and the peroxide number was 1.5 and 1.7 times lower, relative to these indicators in the control sample.

The results confirm the high efficiency of the use of dihydroquercetin as an active antioxidant, which makes it possible to use it along with existing analogues.

Key words: poultry processing, skin from broiler chicken carcasses, mechanically deboned meat, filet of chilled broiler chicken carcasses, natural antioxidants, vitamins E, C, rutin, dihydroquercetin, oxidation products, storage life.

Introduction. Currently, in the meat industry, the creation and production with a functional orientation with a prolonged shelf life are actual. The consumption of such products allows us to stabilize the metabolism in the body and to improve human health. This is an important aspect for the consumer, and the manufacturer, at the same time, gets the opportunity to produce products of guaranteed quality, taking into account unforeseen situations associated with the deviation of temperature conditions of storage, transportation, and sale [1]. But one of the problems in the production of food, in particular, meat, is the extension of the shelf life while maintaining their quality.

The processes of fat oxidation have a negative effect not only on food, but also on the human body, the most dangerous being the appearance and accumulation of free radicals that contribute to the emergence of a number of specific diseases [2]. The ability of dihydroquercetin to bind and intercept such radicals prevents the development of these diseases.

Most modern synthetic antioxidants and their effects on the human body are not well studied, which leads to ambiguous consequences, and their use is inappropriate since the body has its own antioxidant system. In the body, this function is performed by enzymes (catalase, superoxide dismutase, peroxidase, glutathione peroxidase, ubiquinone), albumin and a number of other proteins, including sulfur-containing and selenium-containing, high-density lipoproteins, steroid hormones, bilirubin, uric acid. These substances are helped by exogenous antioxidants - vitamins that enter the body with food. Therefore, one

of the modern trends in meat production for healthy nutrition is the orientation to the use of natural food additives, which can have a pronounced positive effect on the human body. In this regard, safe natural antioxidants deserve much attention, which not only significantly inhibit the oxidation in meat products during storage, but also serve as the active principle of therapeutic and prophylactic products, which makes their use relevant in formulations of a wide range of products.

Dihydroquercetin is one of the most active antioxidants of natural origin used in food production; recognized dihydroquercetin is a natural compound isolated from Siberian larch wood [3]. Russia, in turn, is the only country in the world that has its unique natural resources in volumes suitable for industrial and cost-effective production.

Dihydroquercetin has the highest activity. Antioxidant activity is an indicator that reflects the ability to inactivate free oxygen radicals. The antioxidant activity of dihydroquercetin manifests itself at its concentrations of 10-4 - 10-5. This is the lowest concentration of a substance with antioxidant properties relative to all known exogenous antioxidants, including vitamins A, B, C, D, E, K, β-carotene [4,5].

Adding of dihydroquercetin provides food with additional competitive advantages [4,6].

In addition, the use of natural antioxidants in the production of meat products is due to certain difficulties at the stages of the technological process. Natural antioxidant vitamins easily lose their activity and their structure is destroyed under the influence of various factors: contact with a metal surface, exposure to open sunlight and oxygen, high-temperature treatment (except vitamins A, E, K, and carotenoids) [4,5].

Research conducted at the Sechenov Moscow Medical Academy confirmed that dihydroquercetin is non-toxic, physiologically harmless to human health, does not impart any taste or smell to extraneous products, does not change their color when used. The additive is resistant to temperature (from minus 50 to plus 180 °C), mechanical stresses, and processes occurring in the manufacture of products, that is, it meets all the requirements for whole food additives and, in particular, antioxidants. This compound is included in the list of food additives that do not have a harmful effect on human health when used for cooking food (SanPiN 2.3.2.1078-01 "Hygienic requirements for food safety and nutritional value") [7].

Conducted by relevant Russian institutes (All-Russian Scientific Research Institute of the Dairy Industry, Scientific Research Institute of Storage Problems of the Federal Agency for State Reserves, Kemerovo Technological Institute of Food Industry, All-Russian Research Institute of Meat Industry named after V.M. Gorbatov, All-Russian Scientific Research Institute of Butter making and Cheesemaking, etc.), the studies allowed to develop new technologies and products using dihydroquercetin as a natural antioxidant. Its recommended volume, depending on the fatty acid composition, is 0.005-0.03% by weight of the canned product.

Methods of research. In the first series of studies, during 28 days of storage in a cooled state, in laboratory conditions, comparative studies of the most common natural antioxidants were conducted according to their ability to inhibit the formation of lipid fraction oxidation products in experimental samples of raw materials used in the production of poultry meat products. Antioxidants were added to the experimental finely divided, homogenized samples of raw materials, in accordance with the recommended dosage indicated in table 1.

Table 1 – Dosage options for natural antioxidants in experimental samples of poultry processing raw materials

Antioxidant	Rate of hydration	Raw material		
		fillet	Mechanically deboned meat	Skin
Rutin, mg/kg	1:3	0.59	0.57	0.56
Vitamin C, mg/kg	1:2	0.57	0.56	0.53
Vitamin E, mg/kg	–	0.57	0.56	0.52
Dihydroquercetin, mg/kg	1:3	0.62	0.58	0.57

After 7, 14, 21, and 28 days of storage at a temperature of 3±1 °C, there was a determination in a 3-fold repetition of the content of oxidation products in the control and experimental samples according to acid and peroxide numbers, by common methods.

The use of these antioxidants is regulated by the Methodological Recommendations of the State Sanitary and Epidemiological Regulation of the Russian Federation No. 2.3.1.1915-04 of 2004 "Recommended levels of consumption of food and biologically active substances", establishing adequate and upper acceptable levels of dihydroquercetin (DHQ) consumption in the amount of 25 and 100 mg per

day, vitamin C - 70 and 700 mg per day, vitamin E - 15 and 100 mg per day, rutin - 30 (transferred to rutin) and 100 mg (transferred to rutin), in the food industry [7,8].

Antioxidant preparations, with the exception of vitamin E, were hydrated before being added to the samples for more uniform distribution in the raw material. In the process of storing control and experimental samples in a cooled state, the intensity of accumulation of oxidation products in them was studied weekly according to acid and peroxide numbers by common methods. The results are processed by methods of mathematical statistics.

The second series of studies was to confirm the effectiveness of the antioxidant action of dihydroquercetin during the long-term storage of the mechanically deboned meat in a frozen state. Mechanical boned broiler meat contains skin that, due to its fat content, is significantly susceptible to oxidative spoilage; therefore, it is important to reduce the degree of its influence on the formation of oxidation products in raw materials [2].

The preparation was added to the experimental samples of mechanically deboned meat at a dose of 0.50; 0.75; and 1.00 kg per 100 kg of raw material, in hydrated form. During 6 months of storage at a temperature of –18±1 °C, a monthly determination of the content of oxidation products — acid and peroxide numbers was also carried out in 3-fold repetition in the control and experimental samples.

In accordance with the aim and objectives of the study, the objects of the research were:

- as antioxidants - “Dihydroquercetin” (DHQ), “Ascorbic acid”, “Tocopherol” and “Rutin” [7,8,9,10];
- fillet of chilled carcasses of broiler chickens with pH24 6.2 – 6.5, according to GOST R 52702-2006 [13];
- mechanically deboned meat of broiler chickens according to GOST 31490-2012 [14];
- skin from carcasses of broiler chickens.

Research results. The issue of storage meat products is especially relevant in poultry farming [11] and in beef breeding [12] in view of the wide range of products for the mass consumer.

The comparative analysis and comprehensive assessment of the content of oxidation products in the samples fairly testify to the effect of antioxidants on the reduction of oxidative spoilage of raw materials, but with different efficiencies (table 2).

Table 2 – Change in the acid number of samples, mg KOH/g

Raw material	Control	Vitamin E	Vitamin C	Rutin	DHQ
At the beginning of the experiment:					
Skin	0.196±0.020				
MDM	0.178±0.030				
Fillet	0.112±0.040				
After 7 days of storage:					
Skin	0.936±0.03	0.248±0.01	0.233±0.01	0.218±0.01	0.210±0.01
MDM	0.798±0.24	0.247±0.02	0.223±0.02	0.195±0.01	0.180±0.01
Fillet	0.668±0.57	0.134±0.04	0.122±0.03	0.116±0.04	0.112±0.04
After 14 days of storage:					
Skin	1.028±0.03	0.820±0.01	0.743±0.03	0.603±0.01	0.530±0.01
MDM	0.839±0.10	0.572±0.44	0.443±0.02	0.395±0.01	0.348±0.07
Fillet	0.719±0.01	0.554±0.01	0.422±0.03	0.321±0.03	0.262±0.03
After 21 days of storage:					
Skin	2.153±0.04	1.895±0.02	1.782±0.01	1.691±0.06	1.619±0.08
MDM	1.985±0.10	1.836±0.15	1.652±0.03	1.616±0.03	1.524±0.03
Fillet	1.974±0.09	1.793±0.04	1.593±0.07	1.543±0.07	1.438±0.02
After 28 days of storage:					
Skin	2.542±0.02	2.389±0.01	2.125±0.07	1.925±0.04	1.705±0.04
MDM	2.306±0.06	2.194±0.05	1.897±0.03	1.803±0.04	1.694±0.03
Fillet	2.200±0.08	2.122±0.02	1.822±0.04	1.794±0.06	1.525±0.03

When studying the antioxidant activity of preparations, in parallel with the acid number, the peroxide number was determined - an indicator that characterizes the amount of primary lipid oxidation products (hydroperoxides and peroxides) in experimental samples of raw materials (table 3).

Table 3 – Change in the peroxide number of samples, mmol (SO2)/kg

Raw material	Control	Vitamin E	Vitamin C	Rutin	DHQ
At the beginning of the experiment:					
Skin	0.008±0.0008				
MDM	0.007±0.0012				
Fillet	0.004±0.0004				
After 7 days of storage:					
Skin	2.346±0.20	0.131±0.02	0.098±0.01	0.063±0.01	0.033±0.01
MDM	2.138±0.22	0.118±0.02	0.086±0.01	0.043±0.01	0.025±0.01
Fillet	1.154±0.09	0.078±0.01	0.033±0.01	0.025±0.01	0.013±0.01
After 14 days of storage:					
Skin	3.459±0.09	2.911±0.12	1.443±0.06	0.903±0.08	0.473±0.08
MDM	3.038±0.72	2.708±0.59	1.141±0.34	0.808±0.08	0.360±0.19
Fillet	2.765±0.06	2.078±0.01	1.033±0.01	0.715±0.01	0.313±0.14
After 21 days of storage:					
Skin	4.422±0.08	4.192±0.10	3.948±0.07	3.822±0.05	3.719±0.04
MDM	4.387±0.09	4.106±0.52	3.903±0.03	3.721±0.06	3.659±0.15
Fillet	4.072±0.09	3.922±0.01	3.872±0.08	3.715±0.02	3.595±0.09
After 28 days of storage:					
Skin	5.620±0.03	4.368±0.09	4.232±0.03	4.152±0.09	3.870±0.02
MDM	5.494±0.09	4.284±0.06	4.162±0.03	4.091±0.03	3.829±0.05
Fillet	5.452±0.04	4.219±0.05	4.105±0.08	3.986±0.06	3.729±0.07

In the control skin sample from broiler carcasses, after 7 days of storage of raw materials, the peroxide value reached 2.3459 mmol (SO2)/kg, which characterizes the sample by this indicator as fresh, but not subject to storage. The introduction of antioxidants into experimental samples of raw materials inhibits the formation of lipid oxidation products, therefore, the peroxide number in them was significantly less.

So, with the addition of vitamin E, the peroxide value in the experimental samples was 1.3 times lower than in the control ones. With the introduction of vitamin C, rutin and dihydroquercetin as antioxidants, this indicator in the samples of raw materials was even lower - respectively 1.6; 1.7 and 1.9 times.

The introduction of antioxidants into experimental samples of raw materials in the studied concentrations ensured within 28 days of storage, a lower value of the indicators of oxidative spoilage: the acid number by an average of 74%, and the peroxide number by 1.5-1.7 times, relative to these indicators in the control sample.

To confirm the effectiveness of the antioxidant action of dihydroquercetin during long-term storage of mechanically deboned meat, the second series of studies was held.

The comparative analysis and comprehensive assessment of the accumulation of oxidation products in the control and experimental samples during long-term storage indicates a significant inhibitory effect of dihydroquercetin on the rate of formation of substances that cause oxidative spoilage of mechanically deboned meat of broiler chickens.

The acid number indicates the formation of free fatty acids in raw materials resulting from hydrolytic spoilage of fat. In the studied meat samples, after 1 month of storage, this indicator had the highest value in the control sample that did not contain an antioxidant preparation (0.3873 mg KOH/g). After 6 months of storage, the acid number increased and reached 0.3896 mg KOH/g, which exceeded this indicator in

experimental samples of raw materials at dihydroquercetin levels, respectively: 0.50 kg/100 kg - by 0.0071 mg KOH/g; 0.75 kg/100 kg - per 0.0253 mg KOH/g and at preparation concentration of 1.0 kg/100 kg - 0.0368 mg KOH/g (table 4).

Table 4 – Change in the acid number of mechanically deboned meat during storage (mg KOH/g)

Shelf life	Control	Dihydroquercetin concentration, kg/100 kg		
		0.50	0.75	1.00
1 month	0.3873±0.0199	0.3799±0.0122	0.3624±0.0129	0.3470±0.0093
2 month	0.3876±0.0201	0.3800±0.0120	0.3626±0.0193	0.3473±0.0094
3 month	0.3878±0.0157	0.3803±0.0207	0.3629±0.0162	0.3476±0.0017
4 month	0.3881±0.0230	0.3807±0.0143	0.3633±0.0134	0.3482±0.0192
5 month	0.3889±0.0210	0.3812±0.0621	0.3638±0.0267	0.3495±0.0815
6 month	0.3896±0.0308	0.3825±0.0932	0.3643±0.0384	0.3528±0.0631

While testing, it was established that the antioxidant activity of dihydroquercetin is also effective in the formation of primary lipid oxidation products characterized by the peroxide number (table 5).

Table 5 – Change in the peroxide number of mechanically deboned meat during storage (ммоль($^1/_2O_2$)/кг)

Shelf life	Control	Dihydroquercetin concentration, kg/100 kg		
		0.50	0.75	1.00
1 month	0.0083±0.0008	0.0066±0.0018	0.0058±0.0092	0.0049±0.0012
2 month	0.0084±0.0027	0.0068±0.0046	0.0060±0.0005	0.0052±0.0032
3 month	0.0086±0.0078	0.0069±0.0026	0.0061±0.0015	0.0055±0.0063
4 month	0.0089±0.0088	0.0071±0.0226	0.0063±0.0505	0.0057±0.0612
5 month	0.0092±0.0042	0.0074±0.0066	0.0065±0.0071	0.0060±0.0045
6 month	0.0095±0.0065	0.0077±0.0417	0.0068±0.0731	0.0063±0.0921

The introduction of the dihydroquercetin antioxidant in the composition of the experimental samples in the studied concentrations ensured, after 1 and 6 months of storage, a lower value of the indicators of oxidative spoilage: the acid number by 10%, and the peroxide number by 1.5-1.7 times, relative to these indicators in the control sample.

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ҚҰС ӨҢДЕУ ШИКІЗАТЫН САҚТАУДА ТАБИҒИ АНТИОКСИДАНТТАРДЫҢ ТИІМДІЛІГІН ЗЕРТТЕУ

Аннотация. Өңделген құс шикізатының сақтау мерзімін ұлғайту үшін антиоксидант ретінде дигидрокверцетинды қолданудың тиімділігі зерттелген. Табиғи антиоксидентті дәрумендер Е, С, рутин және дигидрокверцетиннің шайналған ет, механикалық өңделген ет және терісімен бірге балапан – бройлер ұшасының сақталуына ұтымды әсер етудің салыстырмалы бағалауы жасалды. Тәжірибиелі үлгілерге антиоксидантарды енгізу шикізатқа 28 тәулік бойы тотығу көрсеткішінің аз мәнін, қышқылдану 74%, ал ашу санын 1,5-1,7 есе төмендетті.

Алынған нәтижелер дигидрокверцетинді аналогтарымен қатар, қолданудың жоғары тиімді екендігіне көз жеткізді.

Үлгілердегі тотығу өнімдері мөлшерінің салыстырмалы талдауы және комплексті бағалауы үлгілерде антиоксидат әсерінен шикізаттың тотыға бұзылуына әсер ететіндігін көрсетеді, алайда түрлі тиімділікпен жүзеге асырылады.

Антиоксидантарды бақылау үлгідегі шикізатқа қосу оның айтарлықтай тотыға бүліну үдерісін тоқтатады. Е дәруменін ендіргенде 28 тәулік сақтау барысында қышқылдану саны 0,84 мг КОН/г орташа төмен болады, С дәруменін, рутин және дигидрокверцетинді сәйкесінше бақылау үлгімен салыстырғанда 1,27; 3,52 және 3,61 мг КОН/г көрсетеді.

Тәжірибиелі үлгілердің құрамына дигидрокверцетин қосқанда оның тотыға бүліну үдерісін тоқтатады. Антиоксидантты негізгі шикізатқа 0,5 кг/100 кг деңгейінде қосу, бір ай сақтаудан кейін бақылаумен салыстырғанда, қышқылдану 2%, сәйкесінше 0,75 және 1,0 кг – 6 және 10 %, төмендейді. Тәжірбие барысында және 6 ай сақтаудан кейін үлгілерде бақылаумен салыстырғанда сәйкесінше 2, 6 и 9 % төмен көрсетті.

Бақылау және тәжірбие үлгілеріндегі тотығу өнімдерінің жинақталуын салыстырмалы талдау және комплексті бағалау дигидрокверцетинттің механикалық өңделген балапан – бройлерлерді ұзақ сақтау барысында тотыға бүлінуді түзетін заттардың тежелуіне айтарлықтай әсер етеді.

Алынған мәліметтер дигидрокверцетин, басқа табиғи антиоксидантармен салыстырғанда, өңделген құс шикізатында тотығу өнімдерінің түзілуін тиімді тежейді. Атап айтқанда, ірі қара ет өндірісінде келесідей жұмыстарды жүзеге асыруға мүмкіндік береді: сақтау мерзімі ұзақ өнімдерді өндіру; ағзадағы бос – радикалды үдерістерді тежейтін антиоксиданттармен қамтамасыз ету; функционалды бағыттағы азық өнімдерінің ассортиментін кеңейту.

Өңделген құс өнімдерінің сақтау мерзімін ұзартуда дигидрокверцетиннің антиоксиданттық белсенділігі жоғары екендігі анықталды, тотығу өнімдерінің жинақталуын тежейді.

Түйін сөздер: құс өңдеу, балапан-бройлер ұшаларының терісі, механикалық етті сүйектен айыру, балапан-бройлердің салқындатылған сүбесі, табиғи антиоксидант, Е, С дәрумені, рутин, дигидрокверцетин, тотығу өнімдері, сақтау ұзақтығы.

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ИССЛЕДОВАНИЕ ЭФФЕКТИВНОСТИ ПРИРОДНЫХ АНТИОКСИДАНТОВ ПРИ ХРАНЕНИИ СЫРЬЯ ПТИЦЕПЕРЕРАБОТКИ

Аннотация. Исследованы эффективность использования дигидрокверцетина в качестве антиоксиданта, способствующего увеличению продолжительности хранения сырья птицепереработки.

Проведена сравнительная оценка эффективности действия природных антиоксидантов витаминов Е, С, рутина и дигидрокверцетинана продолжительность хранения образцов фаршей из филе, мяса механической обвалки и кожи с тушек цыплят-бройлеров. Введение антиоксидантов в опытные образцы сырья обеспечило в течение 28 дней хранения меньшее значение показателей окислительной порчи: кислотного числа в среднем на 74 %, а перекисного числа – в 1,5–1,7 раза, относительно этих показателей в контрольном образце без добавления антиоксидантов.

Применение дигидрокверцетина в опытных образцах замороженного мяса механической обвалки для длительного хранения в исследуемых концентрациях обеспечило уже через 1 месяц хранения меньшее значение показателей окислительной порчи: кислотного числа на 2–10 %, а перекисного числа – в 1,5 и 1,7 раза, относительно этих показателей в контрольном образце.

Полученные результаты убеждают в высокой эффективности применения дигидрокверцетина в качестве активного антиоксиданта, что обеспечивает возможность его использования наряду с имеющимися аналогами.

Сравнительный анализ и комплексная оценка содержания продуктов окисления в образцах объективно свидетельствуют о влиянии антиоксидантов на снижение окислительной порчи сырья, но с разной эффективностью.

Добавление антиоксидантов в контрольные образцы сырья способствовало существенному торможению его окислительной порчи. При введении витамина Е, кислотное число за 28 дней хранения оказалось ниже в среднем на 0,84 мг КОН/г, при добавлении витамина С, рутина и дигидрокверцетина, соответственно, на 1,27; 3,52 и 3,61 мг КОН/г - по сравнению с контрольным образцом.

Добавление дигидрокверцетина в состав опытных образцов способствовало торможению его окислительной порчи. При введении антиоксиданта на уровне 0,5 кг/100 кг основного сырья после 1 месяца хранения кислотное число оказалось меньше, чем в контрольном образце на 2 %, при добавлении 0,75 и 1,0 кг – на 6 и 10 %, соответственно. Подобная закономерность прослеживалась в течение всего периода эксперимента и после 6 месяцев хранения, значения этого показателя в опытных образцах оказались меньше контроля на 2, 6 и 9 %, соответственно.

Полученные результаты свидетельствуют, что дигидрокверцетин, по сравнению с другими природными антиоксидантами, наиболее эффективно ингибирует образование продуктов окисления в сырье птицепереработки, что обусловливает возможность его применения при производстве мясных продуктов, в частности в мясном скотоводстве, и создает условия для: производства продуктов с пролонгированным сроком годности; обеспечения организма антиоксидантами, предотвращая свободно-радикальные процессы в нем; расширения ассортимента продуктов питания функциональной направленности.

Объективно установлено, что дигидрокверцетин проявляет высокую антиоксидантную активность, препятствуя накоплению продуктов окисления, и способствует значительному увеличению сроков хранения сырья птицепереработки.

Ключевые слова: птицепереработка, кожа с тушек цыплят-бройлеров, мясо механической обвалки, филе охлажденных тушек цыплят-бройлеров, природные антиоксиданты, витамины Е, С, рутин, дигидрокверцетин, продукты окисления, продолжительность хранения.

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IDENTIFICATION OF INTROGRESSIVE WINTER WHEAT LINES WITH WILD RELATIVES PARTICIPATION BY RUST RESISTANCE GENES

Abstract. The genetic basis of winter wheat synthetic lines for leaf rust resistance was characterized by using molecular approaches. Molecular screening showed the presence of the Lr10 resistance gene for 24 lines (as Bezostaya 1 cvs and hybrids with it), for 4 samples-Lr13 (Zhetysu cvs and lines with participation), for 3 samples *Lr16* (Karlygash cvs and lines with its participation), in 8 samples - *Lr39* (*Lr41*) with *Ae.cylindrica* in the pedigree in combination with becrossing of cvs Erythrospermum 350 and cvs Steklovidnaya 24 and for 1 sample - *Lr62*, respectively. For 8 lines with high and partial resistance, *Lr10* genes in combination with *Lr39* (*Lr41*) and one sample with a combination of *Lr10* + *Lr16* genes were identified. The obtained result are consistent with the pedigree, according to which donors with these genes were used to create the studied lines. This material is a valuable source for the wheat breeding for resistance to leaf rust, identified genetically.

Key words: winter wheat, introgressive lines. wild relatives, rust resistance, Lr genes.

Introduction. An analysis of the literature revealed that many parent forms of winter wheat introgressive lines are sources of certain leaf rust resistance genes. Based on the introgressive lines pedigree, it was assumed that certain known leaf rust resistance genes may be present in the synthetic breeding lines of KazRIAPG.

At the previous research stages, it was shown that the new lines had a high degree of juvenile resistance, and in the field artificial infection they revealed a high level of resistance.

This work purpose was to analyze the introgressive lines of KazRIAPG breeding winter wheat of molecular markers linked to the Lr9, Lr10, Lr13, Lr16, Lr19, Lr24, Lr34, Lr39 (41), Lr62 genes and select promising lines containing one or more genes resistance to rust.

Materials and methods. The main material was 26 introgressive lines of winter wheat obtained from the wild relatives crossing (*Triticum militinae, T.kiharae, T. timopheevii, T. polonicum, Aegilops cylindrica, Ae.triaristata (Ae. Neglecta Req. Ex Bertol)* varieties susceptible to leaf rust (Bezostaya 1, Zhetysu, Erythrospermum 350, Karlygash, Steklovidnaya 24) Kazakhstan and Russia breeding, as well as 30 lines with varieties. An analysis of the literature revealed that many parental forms of the introgressive winter wheat lines are sources of certain leaf rust resistance genes. Leaf rust resistance genes found in the genealogy of synthetic lines are shown in Table 1. Based on their genealogy, it was suggested that certain known leaf rust resistance genes may be present in the KazRIAPG breeding synthetic lines. In particular, synthetics may contain the *Lr10* + *Lr34* genes from the commercial cvs Bezostaya 1 [1]; *Lr13* - from cvs Zhetysu, cvs Steklovidnaya 24 [2]; *Lr16* - from cvs Karlygash [3]; *Lr 41* - from the species *A.cylindrica*

[4] and *Lr 62* - from the species *Ae.triaristata* (*Ae. Neglecta* Req. Ex Bertol) [5, 6] respectively (table 1). Of the 80 leaf rust resistance genes described in the gene symbol cataloge (DNA markers have been identified for 50%). From literature sources, we selected well-known DNA markers linked to leaf rust resistance genes: *Lr9, Lr10, Lr13, Lr16, Lr19, Lr24, Lr34, Lr39 (41), Lr62*.

Table 1 – Characterization of parental forms of introgressive winter wheat lines by the presence of leaf rust resistance genes

Variety, view	Resistance genes to three types of rust			Literature
	Yr	*Lr*	*Sr*	
Bezostaya 1	*Yr18*	*Lr3a+Lr10+Lr34*	*Sr5*	[1]
Zhetysu		*Lr13*	*Sr8b+Sr5*	[2]
Erythrospermum 350			*Sr8b+Sr5*	[2]
Karlygash		*Lr16*	*Sr11*	[2]
Steklovidnaya 24		*Lr3a+Lr13?*		[2]
T.timopheevii		*Lr18+Lr50+Lr52+LrTt+LrTt2*	*Sr36+Sr37+Sr40*	[3]
Ae.cylindrica		*Lr39 (Lr41)*		[4]
Ae.triaristata (*Ae. neglecta Req. ex Bertol*)	*Yr 42*	*Lr 62*		[5,6]

Primers were selected based on literature data [7-16], their nucleotide sequences are presented in table 2.

Table 2 – Specific DNA marker primers closely linked to wheat leaf rust resistance genes

Gene	Chromo-some	Marker type	Primer Name	Primer sequence (5′–3′)	Amplification Product, p.o.	Source
Lr9	6BL	STS	J13	F: TCCTTTTATTCCGCACGG CGG	1100	[7]
				R: CCACACTACCCCAAAGAGACG		
Lr10	1AS	RFLP/ STS	2245/ Lr10-6/r2	F: GTGTAATGCATGCAGGTTCC	310	[8-9]
				R: AGGTGTGAGTGAGTTATGTT		
Lr13	7BS	SSR	WMC474	F: ATGCTATTAAACTAGCATGTGTCG	120	[10]
				R: GTGCAAACATCATTCCTGGTA		
Lr16	2BS	SSR	Xwmc 764	F: CCTCGAACCTGAAGCTCTGA	180	[11]
				R: TTCGCAAGGACTCCGTAACA		
Lr19	7DL	STS	Gb	F: CATCCTTGGGGACCTC	130	[12]
				R: CCAGCTCGCATACATCCA		
Lr24	3D	SCAR	$SCS1302_{609}$	F: CGCAGGTTCCAAATACTT TTC	607	[13]
				R: CGCAGGTTCTACCTAATGCAA		
				R: TCATCGACGCTAAGGAGGACCC		
Lr34	7DS	STS	csLV34	F: GTTGGTTAAGACTGGTGATGG	150/229	[14]
				R: TGCTTGCTATTGCTGAATCG		
Lr39 (41)	2DS	SSR	GDM35	F: CCT GCT CTG CCC TAG ATA CG	190/280	[15]
				R: ATG TGA ATG TGA TGC ATG CA		
Lr62	6AS		Opw 7.2	F: CAGGAGCATAGTCATACTTGGG	700	[16]
				R: CTGGACGTCAACAATGGC		

Next, primers were synthesized to the loci of the selected DNA markers on the H-16 DNA/RNA/LNA oligonucleotide synthesizer (Germany), according to the instructions attached to the device. This work was carried out on the basis of the Molecular Biology and Genetic Engineering Laboratory NIIPBB. Wheat DNA was isolated from leaves of 4-5 day old seedlings according to the Dellaporta S.L. method [17]. *Lr* genes were identified using the polymerase chain reaction (PCR) method with primers marking the genes *Lr9, Lr10, Lr13, Lr16, Lr19, Lr24, Lr34, Lr39* (41) and *Lr62*. The reaction composition was selected according to the annotation attached to the enzyme and the characteristics of primers. PCR conditions are given in original sources. Almost isogenic lines of the Thatcher cultivar with the indicated leaf rust resistance genes were used as positive controls for determining known genes, and ddH2O as a negative control.

The production of specific DNA regions was carried out in a Termocycler-Pro thermal cycler (Eppendorf, Germany). Identification of the PCR product was carried out using electrophoresis in 1.5% agarose gel (iNtRON, Biotechnology Grade). The amplified fragments were separated in an electrophoretic chamber (Scie-Plas, UK) in TBE buffer with ethidium bromide addition for 1.5 hours at an electric field voltage of 80 V. Analysis of the electrophoresis was carried out using a Mini BIS Pro gel-documenting system, Israel »With software Gel Capture and Gel Quant Express. The amplified fragment lengths were determined in comparison with DNA markers "100 bp DNA Ladder" (Invitrogen Corporation).

Results and discussion. Molecular genetic screening of synthetic winter wheat lines revealed no markers of highly effective leaf rust resistance genes *Lr9, Lr19* and *Lr24*. According to the pedigree, these resistance genes presence is impossible in the studied samples. Since, *Lr9* gene was introgressed into wheat from *Ae.umbellulatum*, and *Lr19* gene was transferred to common wheat from *Agropyron elongatum* and is located on the 7DL chromosome. The stem rust resistance gene *Sr25* is also located in this translocation [18]. The *Lr24* gene is transferred to the common wheat genome from *Ag. elongatum* at least twice: by translocation in the interspecific hybrid [19] and by induction of homeologic mating [20]. These wild relatives (*Ae. Umbellulatum, Agropyron elongatum*) were not involved in the winter wheat synthetics crossing, which allows us to confirm the absence of these genes in studied lines.

It is known that *Lr10* gene is localized on chromosome *6BL* and in studied lines its source is Bezostaya 1 variety of common wheat [1]. In addition, Lr10 gene is one of the most widely represented in Russian varieties [21]. To identify Lr10 gene, we used the marker F1.2245/*Lr10-6*/r2 [8-9]; the molecular size of amplification product with these primers is 310 bp. This marker is the most used for screening wheat in Western European countries. As a result, a marker linked to the *Lr10* gene was identified in 24 of the 56 analyzed samples (figure 1, table 3). The *Lr10* gene currently belongs to the genes group with surpassed efficiency, which is most likely due to its massive use in breeding, both in Russia and Kazakhstan, and abroad. Most of the above lines had a high susceptibility degree in the field and in the seedling phase, which does not deny this gene presence. The *Lr10* gene marker was not detected in individual lines (table 3), although one of their parental forms was the same Bezostaya 1. Despite the fact that the *Lr10* gene is currently ineffective, it has been shown that its combination with other *Lr*-genes can increase the resistance level [23].

Table 3 – Analysis of synthetic winter wheat lines of the KazRIAPG breeding for the presence of leaf rust resistance genes

Name	Pedigree	Presence of (+) resistance gene (s):					
		Lr 10	*Lr13*	*Lr16*	*Lr 34*	*Lr39 (41)*	*Lr 62*
1	2	3	4	5	6	7	8
RFP-1-1	(Bezostaya 1 x *Ae.triaristata*) x Karlygash			+			
RFP-3-1	Bezostaya 1 x *Ae.cylindrica*	+					
RFP-4-1	(Bezostaya 1 x *T.militinae*) x *T.militinae*-6	+					
RFP-5-1	(Bezostaya 1 x *T.militinae*) x *T.militinae*-9	+					
RFP-6-1	(Bezostaya 1 x *T.militinae*) x *T.militinae*-4	+					
RFP-9-1	Zhetysu x *T.timopheevii*		+				
RFP-12-1	Zhetysu x *T.militinae*		+				

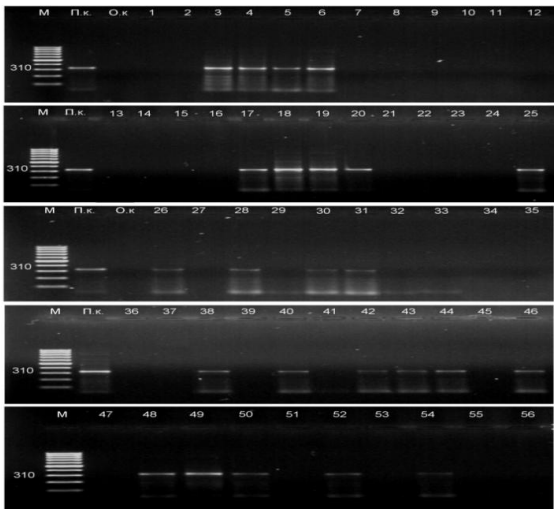
Continuation of table 3

1	2	3	4	5	6	7	8
RFP-14-2	Zhetysu x *T.timopheevii*		+				
RFP-17-2	Erythrospermum 350 x *T.kiharae*	+					
RFP-18-2	Bezostaya 1 x *Ae.cylindrica*	+				+	
RFP-20-2	(Bezostaya 1 x *T.militinae*) x *T.militinae*-9	+					
RFP-21-1	(Bezostaya 1 x *Ae.triaristata*) x Karlygash	+					+
RF-22-2	Zhetysu x *T.militinae*		+				
ЭР350хт2	Erythrospermum 350 x *T.kiharae-2*	+					
1630-2	(Erythrospermum 350x*Ae.cylindrica Host*) x Bezostaya 1	+				+	
1630-5	(Erythrospermum 350 x *Ae.cylindrica H*)x Bezostaya 1	+					
1630-272	(Erythrospermum 350x *Ae.cylindrica Host*) x Bezostaya 1	+					
1634-1	(Bezostaya 1 x *Ae.triaristata Wild*) x Bezostaya 1	+					
1716-42	(Bezostaya 1 x *Ae.cylindrica H.*) x Karlygash	+		+			
1716-45	(Bezostaya 1 x *Ae.cylindrica H.*) x Karlygash			+			
1716-61	(Bezostaya 1 x *Ae.cylindrica H.*) x Karlygash	+					
1717-210	(Bezostaya 1 x *Ae.cylindrica H.*)x Steklovidnaya 24					+	
1717-450	(Bezostaya 1 x *Ae.cylindrica H.*)x Steklovidnaya 24	+				+	
1718-55	(Bezostaya 1 x *Ae.cylindrica H.*) x Erythrospermum 350	+				+	
1718-58	(Bezostaya 1 x *Ae.cylindrica H.*) x Erythrospermum 350	+					
1718-60	(Bezostaya 1 x*Ae.cylindrica Host*) x Erythrospermum 350					+	
1718-62	(Bezostaya 1 x*Ae.cylindrica Host*) x Erythrospermum 350	+				+	
1719-5	(Bezostaya 1 x *Ae.triaristata W.*) x Karlygash	+					
1719-9	(Bezostaya 1 x *Ae.triaristata W.*) x Karlygash	+					
1719-10	(Bezostaya 1 x *Ae.triaristata W.*) x Karlygash	+					
1720-3	(Bezostaya 1 x *Ae.triaristata W.*) x Erythrospermum 350	+					
2040-1	(Bezostaya 1 x*Ae.cylindrica Host*) x Erythrospermum 350	+				+	
2044-3	(*T.polonicum* x Zhetysu) x Zhetysu		+				

The *Lr13* gene is one of the most widely represented in wheat varieties worldwide and is closely linked to the Ne2m hybrid necrosis gene. Until recently, this symptom was used as a morphological marker. McIntosh et al. [23] revealed a close linkage of the *Lr13* gene with *Lr23* in a number of Australian and Indian wheat varieties. Currently, several microsatellite markers are used to identify the *Lr13* gene (Xgwm630, WMC474, Xksm58, Xstm773b). There is conflicting information in the literature about the individual markers effectiveness. More often they are characterized as uninformative. We used the WMC47 microsatellite marker for screening winter wheat introgressive lines. This marker was selected in hybrid combination analysis Leichardt x WAWHT2071 and is used in breeding programs in Australia [10]. As a result of PCR, the Lr13 gene presence was established in Zhetysu x *T.timopheevii* lines; Zhetysu x *T.militinae*; Zhetysu x *T.kiharae*; Zhetysu x *T.militinae*-2 (table 3, figure 2), created on Zhetysu variety basis, which, according to published data, is the carrier of the *Lr13* and Sr8b + Sr5 genes [2]. Earlier, on the phytopathological test basis, it was suggested that the cvs Steklovidnaya 24 may be the carrier of the *Lr13* gene [2]. But, during molecular screening, a specific fragment of amplification was not observed either in cvs Steklovidnaya 24 or in other lines created with the participation of this variety.

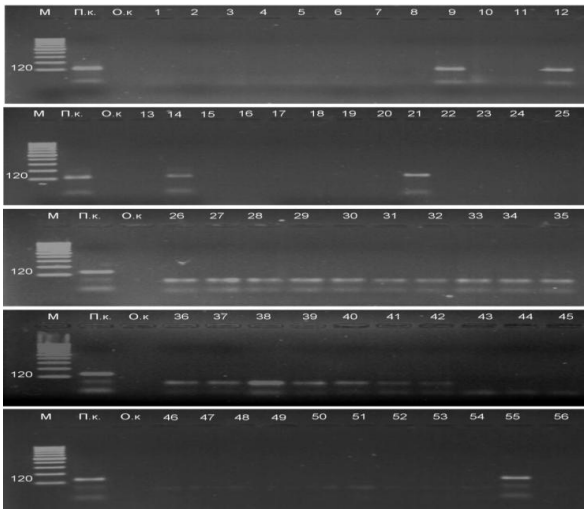
The next *Lr16* gene is located on the 2BS chromosome, the source of the gene is Selkirk (Canada), testing line of the Thatcher variety is RL6005. To identify the *Lr16* gene carriers, we selected the Xwmc764 marker, developed on the SSR marker basis. This marker is localized on the long arm of chromosome 2B and flanks the locus of the Lr16 gene at a 1.9 cm distance [11]. It is found in samples with the *Lr16* gene as an amplification product with a molecular weight of 180 bp. K.Nazari et al. [2] previously identified this gene in cvs Karlygash winter wheat variety by postulating resistance genes. In

our experiments, 10 synthetic lines were created with the cvs Karlygash variety participation. Among them, the *Lr16* gene was identified only in lines 231-1 (Bezostaya 1 x *Ae.triaristata*) x Karlygash,



M - marker (100 bp DNA Ladder), P.C. - positive control (Thatcher line with Lr10), N.c. - negative control (H2O), 1-56 - synthetic lines of winter wheat (samples name and origin are shown in table 3)

Figure 1 – Amplification products using a pair of primers 2245/ *Lr10-6* /r2 to a diagnostic marker linked to the sheet rust resistance gene *Lr10*



M - marker (100 bp DNA Ladder), P.K. - positive control (Thatcher line with Lr13), N.c. - negative control (H2O), 1-56 - synthetic lines of winter wheat (samples name and origin are shown in table 3)

Figure 2 – Amplification products using a pair of WMC474 primers for a diagnostic marker linked to the sheet rust resistance gene *Lr13*

1716-42 and 1716-45 (table 3), representing selections from one combination. For most of the lines, the presence of this gene was not detected.

The *Lr39* (Lr41) gene was transferred to common wheat from five samples *Ae. tauschi* of various geographical origin, as well as from *Ae.cylindrica*. The *Lr39* gene is predominantly found in North American varieties, and the Thunderbolt variety was the first to introduce this gene. In our experiments, many synthetic winter wheat lines (20 lines) were obtained with the participation of *Ae.cylindrica*, in connection with which we suggested that these lines can carry the *Lr39* gene (*Lr41*). Currently, the identification of this gene is possible based on various molecular markers analysis. According to published data, the SSR marker to the GDM35 locus is the most diagnostic compared to other markers [16].

In this regard, in this experiment, we used a pair of primers for the SSR locus of GDM35 marker. When using GDM35 primers in lines with a functional allele of *Lr39* gene (*Lr41*), an amplification product with a molecular weight of 190 bp is detected, with a non-functional allele from 214 to 280 bp. (depending on the genotype), heterozygous - both of these products. The distance between the marker and the gene is estimated at 1.9 cM [15]. As a result, PCR in 8 lines (1718-2, 1630-2, 1717-210, 1717-450, 1718-55, 1718-60, 1718-62, 2040-1) out of 56 detected a diagnostic marker linked to the *Lr39* gene (*Lr41*). At the same time, at the previous research stages (table 4), it was shown that the marked lines had a high degree of juvenile resistance, and in the field, against the background of artificial infection, they revealed a high age resistance level.

Table 4 – Field resistance of promising lines of winter wheat from 2 nurseries to fungal diseases

Sample Name	Winter hardiness / regrowth, score	Spikeling date	Type and degree of damage, score /%					The development degree of leaf spot,%	
			yellow rust		leaf rust				
			1	2	1	2	3	1	2
1	2	3	4	5	6	7	8	9	10
1630-2	5/4	19.05.16	1/5	2/5	1/10	2/10	3/30	5	10
1630-4	5/5	17.05.16	0	0	2/10	3/20	3/40	10	10
1630-5	5/5	17.05.16	0	0	3/20	4/30	4/60	0	0

Continuation of table 4

1	2	3	4	5	6	7	8	9	10
1630-10	5/5	15.05.16	0	0	2/10	3/10	3/20	5	10
1630-272	5/5	13.05.16	2/5	2/10	1/5	2/5	4/30	5	10
1634-1	5/5	15.05.16	2/20	2/20	1/5	2/5	2/10	5	10
1675-72	4/5	18.05.16	2/10	2/10	2/10	3/10	3/10	10	20
1675-72	4/5	18.05.16	2/5	4/10	2/5	2/5	3/10	10	10
1680-4	4/5	20.05.16	0	2/5	1/5	1/5	2/10	10	10
1680-9	4/5	16.05.16	2/5	2/5	1/5	1/5	1/5	5	10
1712-8	5/5	16.05.16	0	0	2/5	2/5	2/10	5	10
1712-36	5/5	17.05.16	2/10	2/10	2/20	4/30	4/40	20	20
1716-42	5/5	18.05.16	0	0	2/30	3/50	4/60	10	10
1716-45	5/5	16.05.16	2/20	3/20	2/20	3/20	4/30	20	20
1716-61	5/5	16.05.16	0	1/5	1/5	1/5	3/30	40	40
1717-210	5/4	17.05.16	0	0	0	0	2/10	20	30
1717-450	4/5	17.05.16	0	0	0	0	0	40	20
1718-55	4/5	19.05.16	0	0	0	0	0	0	5
1718-58	4/5	19.05.16	0	0	2/20	3/40	4/60	20	30
1718-60	4/5	16.05.16	0	0	0	0	0	0	0
1718-62	5/5	17.05.16	0	0	0	0	0	20	20
1719-3	5/5	16.05.16	0	0	0	0	0	10	10
1719-5	4/5	17.05.16	0	0	2/10	3/10	4/30	20	30
1719-9	4/5	15.05.16	0	0	1/5	3/10	4/20	10	10
1719-10	5/5	15.05.16	0	0	2/20	3/20	4/50	10	10
1719-215	5/5	14.05.16	0	0	2/10	4/30	4/60	30	40
1720-3	5/5	14.05.16	1/5	1/5	2/20	2/40	3/60	20	20
1721-69	5/5	15.05.16	2/20	4/30	1/5	1/5	1/5	10	20
2040-1	5/5	15.05.16	3/10	3/10	3/10	3/10	3/10	20	20
2044-3	5/5	17.05.16	0	1/5	0	0	0	20	20
Steklov. 24	5/5	05.05.16	3/30	4/40	3/20	4/30	4/60	40	40

Thus, the results of molecular screening are consistent with phytopathological data. In addition, fragments with a non-functional allele (from 214 to 280 bp) were amplified in 32 lines, and null alleles of the *Lr39* gene (*Lr41*) were detected in 16 lines.

The *Lr34* gene belongs to the group of genes that provide partial (partial) resistance, which is characterized by horizontal stability indicators: an increase in the latent period, a decrease in the number of pustules and their size. This gene was first described by Dyck in 1977 [22], and later the same author established its localization in chromosome 7D [24]. Further studies showed that the *Lr34* gene is located on the short arm of chromosome 7D [25]. In addition, it was found that it is genetically inseparable from the APR gene *Yr18*, associated with moderate resistance to yellow rust [26, 27]. The cosegregation of this gene with the powdery mildew resistance gene Pm38 was revealed [28]. The locus is also associated with resistance to the yellow dwarf virus of barley *Bdv1* [29]. The main morphological manifestation of the *Lr34* gene is leaf tips necrosis [30]. In the world, a lot of work has been done on monitoring wheat collections for the presence and elucidation of the allelic state of the *Lr34* gene using molecular genetic markers. In Russian varieties, the *Lr34* gene is widely used from Bezostaya 1, which is widely used in wheat hybridization. Despite the fact that *Lr34* gene efficiency in Russia has been lost, it has been shown that its combination with other race-specific genes, for example *Lr13*, significantly increases the level of field resistance [22].

The codominant STS marker csLV34 was derived from the RFLP marker and is closely linked to the Lr34 locus (0.4 cM) [11]. This marker is most commonly used for screening wheat around the world. When using csLV34 primers, an amplification fragment with a molecular weight of 150 bp indicates the presence of a functional gene allele, 229 bp - to a non-functional allele, and of both fragments to a heterozygous state. We used this marker to identify the *Lr34* gene in the studied winter wheat lines. As a result, a specific amplification product with a molecular weight of 150 bp found only in the control line with the *Lr34* gene. The absence of a functional allele of the *Lr34* gene in the studied lines is probably due to the use of various genetic material and the characteristics of the selection process. To more accurately answer this question, it is necessary to conduct additional studies using other markers. Although, an amplification product of 229 bp in size, indicating the presence of a non-functional allele of the gene, was observed in many synthetic lines (25 lines) obtained with the participation of Bezostaya 1 (table 3).

Translocation with the *Lr62* gene is transmitted to common wheat from *Ae. neglecta* Req. ex Bertol (*Ae.triaristata*) and can be localized on chromosome 6AS. The yellow rust resistance gene *Yr42* is also located in this translocation. The *Lr62* gene is effective against a wide range of *Puccinia triticina* pathotypes in southern Africa and western Canada [5, 6]. To identify the *Lr62* gene, the only molecular marker Opw 7.2 was proposed [16]; however, this marker is still validated for use in MAS schemes. However, in our experiments, we used the Opw 7.2 marker for molecular screening of 9 synthetic lines obtained from the crossbreeding of common wheat varieties with *Ae.triaristata* (*Ae. Neglecta* Req. Ex Bertol). It should be noted that we do not have a line — the positive control of *Lr62* — and its presence was judged by the presence of a diagnostic fragment (700 bp) during PCR analysis. As a result, fragments of different sizes and not only those declared as diagnostic are amplified. A 700 bp amplicon, described as a diagnostic fragment by A. Eksteen [16], was observed at line 231-2 (Bezostaya 1 x *Ae.triaristata*) x Karlygash (table 3). However, the visualization in the agarose gel was not clear enough, which does not allow us to conclude that this gene is present in this line, and the results should be regarded as preliminary. Moreover, this work requires continuation, in particular, conducting a phytopathological test and PCR analysis using an effective molecular marker, as well as a cytogenetic study of the transfer of genetic material from *Ae. neglecta* Req. ex Bertol (*Ae.triaristata*) into created synthetic lines.

Of particular importance are these research results due to the fact that high elements content found highly resistant genotypes among previously identified sources.

Conclusions. The *Lr10* gene was identified for 24 (out of 56) lines, in the genealogy of which there is a Bezostaya 1 variety (also a carrier of this gene) and was not found for 9 lines. For the *Lr13* gene, its presence was noted in 4 lines created with the Zhetysu cvs participation. The *Lr16* gene was detected for Karlygash cvs and in 3 out of 10 lines that have it in pedigree, these are numbers 231-1; 1716-42 and 1716-45. For 8 out of 20 lines with the presence of *Ae.cylindrica* in the origin, a marker linked to the *Lr39* gene (*Lr41*) was detected, and in combination with cvs Erythrospermum 350 and Steklovidnaya 24.

It is known that a combination of several leaf rust resistance genes in one genotype can provide more reliable and long-lasting protection due to the genetic resistance basis expansion. In 8 lines with high and partial resistance (1718-2, 1630-2, 1717-210, 1717-450, 1718-55, 1718-60, 1718-62, 2040-1), *Lr10* genes in combination with *Lr39* (*Lr41*), (1716-42) was one sample –with a combination of *Lr10 + Lr16* genes was revealed. Thus, the results of molecular screening are consistent with phytopathological data [32].

Thus, using molecular approaches, the genetic basis of winter wheat synthetic lines for leaf rust resistance was characterized. This material is a valuable source for the wheat breeding on leaf rust resistance.

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ГЕНІ ТАТҚА ТӨЗІМДІ ЖАБАЙЫ ТҰҚЫМДАСТАРДЫҢ ҚАТЫСУЫ АРҚЫЛЫ КҮЗДІК БИДАЙДЫҢ ИНТРОГРЕССИВТІК СЫЗЫҚТАРЫН ИДЕНТИФИКАЦИЯЛАУ

Аннотация. Қазақстан және Ресей селекциясының жабайы тұқымдастармен будандастыру арқылы алған күздік бидайдың 26 интрогрессивті сызығымен (*Triticum militinae, T.kiharae, T.timopheevii, T.dicoccoides, Aegilops cylindrica, Ae.triaristata* (*Ae. neglecta Req.ex Bertol*) жапырақты татқа тұрақты және сезімтал сұрыптар («Безостая 1», «Жетісу», «Эритроспермум 350», «Қарлығаш», «Стекловидная 24»), сонымен қатар табиғи және жасанды фон негізінде аталық және аналық түрлеріне қатысты дифференциалданған 30 сызық. Lr гендерін жүйелеу праймермерлермен, Lr9, Lr10, Lr13, Lr16, Lr19, Lr24, Lr34, Lr39(41) және Lr62 генін маркерлейтін полимеразалы тізбек (ПТР) әдісін қолдану арқылы жүргізілді.

24 сызыққа қатысты Lr10 гені жүйеленді, олардың ішінде аталық және аналық түрлерінде «Безостая 1» (сонымен қатар ген тасымалдаушысы) кездесті және 9 сызыққа қатысты анықталмады. Жетісу сұрыбының қатысуы арқылы алынған сызықта Lr13 гені анықталды. «Қарлығаш» сұрыбына арналған Lr16 гені анықталды және 10 сызықтың 3-де дәлелденді, педигриде 231-1 (Безостая 1 х *Ae.triaristata*) х Қарлығаш); 1716-42 (Безостая 1 х *Ae.cylindrica H.*) х Қарлығаш)) және 1716-45 (Безостая 1 х *Ae.cylindrica H.*) х Қарлығаш)). Ae.cylindrica қатысуы арқылы алынған 20 сызықтың 8-інде Lr39 генімен (Lr41) байланысқан маркер анықталды және «Эритроспермум 350» және «Стекловидная 24» комбинациясында қанықкан.

Бір генотиптегі бірнеше жапырақты татқа төзімді гендердің комбинациясы төзімділіктің генетикалық негізінің кеңеюіне байланысты неғұрлым сенімді және ұзақ мерзімді қорғауды қамтамасыз ететіні белгілі. Жоғары және ішінара тұрақтылыққа ие сегіз сызықта (1718-2, 1630-2, 1717-210, 1717-450, 1718-55, 1718-60, 1718-62, 2040-1) бастапқы көзі Ae.cylindrica болып саналатын Lr39 (Lr41) үйлесімінде Lr10 гені анықталды. Ae.cylindrica тән болып келетін Lr10+Lr16 ген комбинациясы бір үлгіде (1716-42) анықталды. Молекулалық скрининг Lr10 тұрақтылық гені 56 сызықтың 24-нде («Безостая 1» сортында және ондағы будандарда), 4 үлгіде Lr13 («Жетісу» сорты және оның қатысуы арқылы алынған сызықтар), 3 үлгіде Lr16 (Қарлығаш сорты және оның қатысуы негізінде алынған сызықтар), 8 үлгідегі Lr39 (Lr41) комбинациясында Ae.cylindrica арқылы «Эритроспермум 350» және «Стекловидная 24» сорттарымен қанықкан, сәйкесінше жоғары және ішінара тұрақтылығы бар Lr10 гені негізінде Lr39 (Lr41) және бір үлгідегі Lr10 + Lr16 генінің жиынтығы бар үлгі (Безостая 1 х *Ae.triaristata*) х Қарлығаш-2 Lr10 Lr62.

Сары тотқа төзімді генотиптер арасында жапырақты тотқа тұрақты сызықтар белгілі болды: 1719-3, 1719-5, 1719-9, 1719-10, 1719-215, Lr10 комбинациясында асылтұқымды Ae.triaristata (Yr 42) бар.

Осылайша, молекулалық тәсілдерді қолдана отырып, күздік бидайдың синтетикалық жолдарының генетикалық негізі олардың жапырақты татқа төзімділігі негізінде сипатталды. Бұл материал табиғи және жасанды иммунологиялық талдаулар нәтижесінде алынған және бидай-эгилопс KZ231 негізінде бидай сұрыбын құру арқылы дәлелденген бидай сұрыпталуының құнды көзі болып саналады (10.23.2019 ж. №199 / 025.4 патенттік өтінім).

Түйін сөздер: күздік бидай, интрогресивті үлгілер, жабайы тұқымдас, тат ауруына тұрақтылық, Lr-гендері.

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ИДЕНТИФИКАЦИЯ ИНТРОГРЕССИВНЫХ ЛИНИЙ ОЗИМОЙ ПШЕНИЦЫ С УЧАСТИЕМ ДИКИХ СОРОДИЧЕЙ ПО ГЕНАМ УСТОЙЧИВОСТИ К РЖАВЧИНЕ

Аннотация. 26 интрогрессивных линий озимой пшеницы, полученные от скрещивания дикорастущих сородичей (*Triticum militinae, T.kiharae, T.timopheevii, T.dicoccoides, Aegilops cylindrica, Ae.triaristata* (*Ae. neglecta Req.ex Bertol*), с умеренно устойчивыми и восприимчивыми к листовой ржавчине сортами (Безостая 1, Жетысу, Эритроспермум 350, Карлыгаш, Стекловидная 24) селекции Казахстана и России, а также 30 линий с насыщением сортов дифференцированы ранее на естественном и искусственном фоне относительно родительских форм. Идентификацию генов Lr осуществляли с использованием метода полимеразной цепной реакции (ПЦР) с праймерами, маркирующими гены Lr9, Lr10, Lr13, Lr16, Lr19, Lr24, Lr34, Lr39(41) и Lr62.

Ген Lr10 идентифицирован для 24 линий, в родословной которых присутствует сорт Безостая 1 (также носитель этого гена) и не обнаружен для 9 линий. Для гена Lr13 отмечено его присутствие в линиях, созданных с участием сорта Жетысу. Ген Lr16 выявлен для сорта Карлыгаш и у 3-ех из 10 линий, имеющих его в педигри, это номера 231-1 (Безостая 1 х *Ae.triaristata*) х Карлыгаш); 1716-42 (Безостая 1 х *Ae.cylindrica H.*) х Карлыгаш) и 1716-45 (Безостая 1 х *Ae.cylindrica H.*) х Калыгаш)). Для 8 из 20 линий с присутствием в происхождении *Ae.cylindrica* детектирован маркер, сцепленный с геном Lr39 (Lr41), причем в комбинациях с насыщением Эритроспермум 350 и Стекловидная 24.

Известно, что сочетание нескольких генов устойчивости к листовой ржавчине в одном генотипе может обеспечивать более надежную и продолжительную защиту вследствие расширения генетической основы устойчивости. В 8 линиях с высокой и частичной устойчивостью (1718-2, 1630-2, 1717-210, 1717-450, 1718-55, 1718-60, 1718-62, 2040-1) выявлены гены Lr10 в сочетании с Lr39 (Lr41), источником которого является Ae.cylindrica. Выявлен один образец (1716-42) с комбинацией генов Lr10+Lr16, для всех характерно присутствие Ae.cylindrica. Молекулярный скрининг показал наличие гена устойчивости Lr10 у 24 из 56 линий (как у сорта Безостая 1 и гибридов с ним), у 4 образцов – Lr13 (сорт Жетысу и линии с его участием), у 3 образцов - Lr16 (сорт Карлыгаш и линии с его участием), у 8 образцов – Lr39 (Lr41) с присутствием в происхождении *Ae.cylindrica* в комбинациях с насыщением сортов Эритроспермум 350 и Стекловидная 24, соответственно с высокой и частичной устойчивостью выявлены гены Lr10 в сочетании с Lr39 (Lr41) и один образец с комбинацией генов Lr10+Lr16 и образец (Безостая 1 х *Ae.triaristata*) х Карлыгаш-2 Lr10 Lr62.

Среди генотипов, устойчивых к желтой ржавчине, дополнительно устойчивости к листовой ржавчине отмечены формы: 1719-3, 1719-5, 1719-9, 1719-10, 1719-215, имеющие в своей родословной *Ae.triaristata* (Yr 42) в комбинации с Lr10.

Таким образом, с использованием молекулярных подходов была охарактеризована генетическая основа синтетических линий озимой пшеницы по устойчивости к листовой ржавчине. Данный материал является ценным источником для селекции пшеницы на устойчивость к листовой ржавчине, как было показано в результате иммунологического анализа на естественном и искусственном фоне и подтверждено созданием нового сорта на пшенично-эгилопсной основе KZ231 (Заявка на патент №2019/025.4 от 23.10.2019 г.).

Ключевые слова: озимая пшеница, интрогрессивные линии, дикие сородичи, устойчивость к ржавчине, Lr-гены.

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PECULIARITIES OF THE LENTIL PRODUCTIVITY FORMATION UNDER THE USE OF NITROGEN-FIXING AND PHOSPHATE-MOBILIZING MICROORGANISMS

Abstract. Research goal. To study the peculiarities of lentil productivity formation under the effect of nitrogen-fixing and phosphate-mobilizing microorganisms in the Forest-Steppe of Ukraine. **Methods.** Field, laboratory, and statistical. **Results**. The maximum number and weight of active nodules on the lentil roots were formed in the stage of bean filling when the plant's need for nitrogen was the highest. Seed inoculation with formulation Rizohumin contributed to a 5.3 times increase in the number of active nodules in the budding stage, 4.5 times in the flowering stage, and 3.8 times in the bean-filling stage compared to the control treatment. The best indicators of active symbiotic potential demonstrated the treatment with seed inoculation with Rizohumin and the use of phosphate-mobilizing formulation Polymixobacterin and Azohran B in combination with foliar dressing using Alga 600. In the same treatments, in the flowering stage, the maximum content of leghemoglobin in the fresh mass of nodules (5.58 and 5.50 mg/g) was obtained. In the flowering stage, plants formed the maximum leaf area (40 300 m^2/ha) in the treatments with Rizohumin, Azogran B, and Alga 600. When using a combination of Rizohumin, Polymixobacterin and Alga 600, 128.0 kg/ha of nitrogen, 43.4 kg/ha of phosphorus, and 60.8 kg/ha of potassium was needed for yield formation. At the same time, under the joint application of Rizohumin, Azorgan B and Alga 600, the need was 118.0 kg/ha, 40.0 kg/ha, and 56.0 kg/ha, respectively, which corresponded to the maximum indicators of the nutrient uptake in the experiment. The use of Rizohumin + Azogran B + +Alga 600 resulted in the lentil yield of 1.79 t/ha; whereas in the treatments with Rizohumin + Polymixobacterin + +Alga 600, the maximum yield was obtained (1.95 t/ha).

Key words: lentils; seed inoculation; tuber bacteria; leghemoglobin; symbiotic potential.

Introduction. Lentil belongs to crops with quite high drought and cold resistance and good adaptability to growing in temperate climates [1]. However, existing standpoints on the inexpediency of fertilization do not allow attaining the maximum realization of the crop biological potential [2]. Apart from this, it should be noted that growing eco-lentil requires minimal use of mineral fertilizers and other synthetic agrochemicals [3].

Neglecting the basic biological requirements of the crop eventually leads to unstable productivity, significant influence of uncontrolled growing factors, etc. Thus, if one does not take into account the factors of demand for lentil seeds, in Ukraine, in 2017, the crop occupied 8 300 hectares with the average yield of 1.4 t/ha, in 2018, 24 500 hectares with a yield of 0.8 t/ha, and 2019, 7 300 hectares in yield of 1.07 t/ha [4].

The importance of using nutrients for the formation of the crop unit of legumes grows with the fact that they require much more than cereals. Despite the demand for the availability of nutrients in the soil, mineral fertilizers are not often used in legumes, because under favourable conditions of symbiosis

(pH 6–7, sufficient supply of phosphorus, potassium, magnesium, boron, molybdenum, the availability of specific strains of nodule bacteria, optimal soil moisture) lentil can uptake up to 160 kg/ha of nitrogen during vegetation [5].

However, in practice, due to the influence of adverse conditions, the activity of symbiosis weakens, and only 20–60 kg of nitrogen per hectare is fixed. Such differences between optimal conditions are often caused by increased soil acidity, lack of moisture, nutrients or soil-specific microorganisms, etc. [6].

The nitrogen problem is inseparably linked to the availability of phosphorus to plants since plants in the first half of the vegetation season use most of the phosphorus. Besides, phosphorus in the soil is relatively low-mobile compared to other nutrients. For example, phosphorus compounds can be absorbed by root hairs from a distance of 2–4 mm, while nitrogen and potassium can be absorbed from a minimum distance of 15 mm and NO_3 even from a distance of 40 mm [7].

Phosphorus is often present in the form of unavailable to plants compounds. To illustrate, the main source of phosphorus to plant is anions of orthophosphoric acid ($H_2PO_4^-$, HPO_2^{4-} and PO_4^{3-}), but plants can partially absorb poly- and metaphosphates and some organic phosphorus compounds. Plants best absorb $H_2PO_4^-$, anions, and worse HPO_2^{4-}. Anion PO_4^{3-} is unavailable to plants, it is used only by certain legumes, buckwheat and some other plants [8].

The use of the inoculants of nitrogen-fixing and phosphate-mobilizing microorganisms is addressed to solve the problem of the lack of essential nutrients for lentil plants. However, in the technology of inoculation itself, there are also unexplored issues. For example, when combining two inoculants (phosphate-mobilizing and nitrogen-fixing) the positive effect of one of them can be blocked by the negative influence of the other because there can be a competition between biological agents.

Therefore, the study of the peculiarities of the use of inoculants of nitrogen-fixing and phosphate-mobilizing microorganisms and foliar feeding for lentil and revealing their role in the formation of lentil productivity is essential.

The **research goal** was to study the peculiarities of lentil productivity formation under the effect of applied nitrogen-fixing and phosphate-mobilizing microorganisms in the Forest-Steppe of Ukraine.

Methods and materials. The study was carried out in the zone of sufficient soil moisture with the average annual rainfall from 600 to 620 mm and an average annual temperature of 7.8°C (Uladivske-Liulyntsi Research Breeding Station). The soil for the experiment was chernozem with the following agrochemical characteristics: pH_{Salt} of 6.0, humus content of 3.72 %, nitrogen content of 120 mg/kg, mobile phosphorus content of 194 mg/kg, and potassium content of 104 mg/kg.

The weather conditions in the years of the experiment were generally favourable for plant growth and development. Thus, the greatest precipitation amount during lentil vegetation was observed in 2018 with 360.6 mm, and in 2019 with 316 mm, while the least was in 2017 with 283.1 mm.

The layout of the experiment is given in Table 1. For the experiment domestic lentil variety 'Antonina' was used. The experiment was carried out in a randomized plot design with four replications in plots of an area of 25 m^2.

Lentil seeds were treated with inoculants before sowing, then with growth stimulants in the budding stage at the doses recommended by the manufacturer. To avoid the negative interference of microorganisms, they were introduced separately: phosphate-mobilizing bacteria in the row zone to the depth of lentil seed burying, while the nitrogen-fixing bacteria were used to inoculate seeds.

Biophosphorin (Azogran B) contains live cells and spores of *Bacillus megaterium* strain LZ 20 with a titer of 1x109 CFU/ml and metabolism products. This bacterial strain can convert hard-to-reach phosphorus and potassium compounds into easily digestible by plant forms.

Polymixobacterin contains a bacterium strain *Paenibacillus polymyxa* KV that can produce organic acids and enzyme phosphatase, which provides dissolution of difficult to dissolve mineral and organic soil phosphates.

Rizohumin contains a suspension of *Rhizobium leguminosarum* (first component) nodule bacteria and a solution of physiologically active substances of biological origin (auxins, cytokinins, amino acids, humic acids), microelements in chelated form, and macroelements in the start concentrations.

The ALGA 600 biostimulant contains the following seaweed extracts: *Sargassum*, a source of alginic acid and cytokinins; *Laminaria*, a source of laminarin polysaccharide; *Ascophyllum Nodosum*, a source of alginic acid, mannitol and phytohormones.

The number and weight of nodules on the root system of plants were determined according to Volkohon [10]. The content of leghemoglobin in the nodules was evaluated by the method of Posypanov [11].

Results and discussion. Seed inoculation affected the number and weight of active nodules on the root system of lentil plants (table 1).

Table 1 – The number of active nodules on the lentil roots and their wet weight (per plant) as affected by the components of the agricultural technology, the average for 2017/19

Seed inoculation	Introduction in the row	Foliar dressing	Phenological stage					
			Budding		Flowering		Bean filling	
			the number of active nodules	wet weight of active nodules	the number of active nodules	wet weight of active nodules	the number of active nodules	wet weight of active nodules
Without inoculation	Control (without application)	No foliar dressing	4.0	6.8	7.1	27.2	8.8	36.9
		Alga 600	4.0	6.7	7.2	27.1	9.2	36.8
	Polymixobacterin	No foliar dressing	4.2	6.6	7.9	29.2	10.0	39.8
		Alga 600	3.8	6.8	7.3	26.3	9.3	36.0
	Biophosphorin (Azogran B)	No foliar dressing	3.9	6.7	6.9	26.3	9.1	36.0
		Alga 600	4.0	6.7	7.3	27.5	9.7	37.4
Rizohumin	Control (without application)	No foliar dressing	21.4	3.5	30.8	218.9	34.0	267.3
		Alga 600	20.4	33.1	33.4	230.2	35.8	278.8
	Polymixobacterin	No foliar dressing	20.9	34.6	32.4	238.6	35.8	289.2
		Alga 600	20.7	34.2	34.9	246.6	36.5	293.9
	Biophosphorin (Azogran B)	No foliar dressing	21.7	34.4	31.6	235.3	35.1	283.1
		Alga 600	20.7	33.8	34.4	238.4	36.2	288.3
$LSD_{0.05}$			1.1	1.6	1.8	2.3	2.5	4.4

Control treatments without seed inoculation with Rizohumin had rather modest indicators of colony formation by nitrogen-fixing nodule bacteria. Thus, in the budding stage, on average, the number of nodules per plant was 4.0, with the average wet mass of 6.7 g/plant. At the same time, in the treatments with inoculation with Rizohumin, in this stage, the number of nodules was 5.3 times higher, and their wet weight was 5.1 times higher than in the control treatments. Similar trends in the formation of the nodule bacteria colonies remained through the vegetation period, with the treatments with seed inoculation being significantly different from the control ones.

In the flowering stage, the number of active nodules per plant in the Rizohumin inoculated treatments of the experiment was 30.8–34.9, with their wet weight ranging from 218.9 to 246.6 g/plant. The maximum indices of the number and weight of active nodules on the roots of lentil were in the stage of bean filling when the plant's need for nitrogen was the highest.

Concerning the influence of other experimental factors on the state of the symbiotic apparatus of lentil, in the treatments with Polymixobacterin and Azogran B, the number and wet weight of active nodules in the budding stage were higher than in the control treatment, but their deviations were within the experimental error. This can be explained by the sufficient availability of phosphorus in the soil at the beginning of the growing season. However, in the flowering, the number of nodules per plant for the use of phosphate-mobilizing formulations was higher by 1.6 and 0.8 g/plant and their wet weight was higher by 19.6 and 16.4 g/plant, respectively than in respective control treatments. Similarly, we observed an increase in the number of active nodules and their wet weight in the flowering and bean-filling stage with foliar dressing using Algae 600. Therefore, the provision of optimal conditions for the growth and development of lentil plants affects the formation of nodule bacteria colonies on their roots.

However, the calculation of these indicators is not enough to understand the processes of symbiotic nitrogen fixation as a whole, and therefore the efficiency of nodule bacteria colonies is determined in terms of the total and active symbiotic potential (table 2).

Table 2 – The total and active symbiotic potential of lentil (1 000 kg·day/ha)
as affected by the components of the agricultural technology, the average for 2017/19

Seed inoculation	Introduction in the row	Foliar dressing	Interstage period			
			Budding – flowering		Flowering – bean filling	
			total symbiotic potential	active symbiotic potential	total symbiotic potential	active symbiotic potential
Without inoculation	Control (without application)	No foliar dressing	33.2	20.0	89.5	51.8
		Alga 600	33.4	19.9	98.8	56.4
	Polymixobacterin	No foliar dressing	34.3	21.6	92.8	57.1
		Alga 600	34.2	19.7	101.0	55.7
	Biophosphorin (Azogran B)	No foliar dressing	34.7	20.1	94.7	52.1
		Alga 600	34.4	20.5	101.9	58.2
Rizohumin	Control (without application)	No foliar dressing	214.8	191.2	493.6	442.0
		Alga 600	221.3	200.8	551.1	504.5
	Polymixobacterin	No foliar dressing	227.2	206.9	521.8	479.7
		Alga 600	241.3	221.1	597.9	553.3
	Biophosphorin (Azogran B)	No foliar dressing	224.0	203.7	511.9	469.6
		Alga 600	228.3	208.3	567.9	523.8

In the treatments without inoculation with Rizohumin, in the interstage period of budding–flowering, the total symbiotic potential was 34 000 kg·day/ha, and active symbiotic potential 20 300 thousand kg/ha, which was only 59.6 % of the total. However, with the use of Rizohumin, the total symbiotic potential was 226 1000 kg·day/ha, and the active one was 205 300 kg·day/ha, which made up 90.8 % of the total potential. Similar patterns continued in the interstage period of flowering – bean filling. Therefore, the use of seed inoculation with Rizohumin contributed to an increase in the active symbiotic potential to 90.8–91.6 % of the total symbiotic potential.

The best indicators of active symbiotic potential were obtained in the treatments with seed inoculation with Rizohumin, and the use of phosphate-mobilizing formulations Polymixobacterin and Azogran B in combination with foliar dressing with Algae 600.

Leghemoglobin is an indicator of the physiological activity of nodule bacteria; therefore, its study allows more accurate description of the state of lentil symbiotic apparatus (table 3).

Table 3 – Leghemoglobin content in lentil nodules (mg/g of wet weight)
as affected by the components of the agricultural technology, the average for 2017/19

Seed inoculation	Introduction in the row	Foliar dressing	Phenological stage		
			Budding	Flowering	Bean filling
Without inoculation	Control (without application)	No foliar dressing	0.20	2.12	1.85
		Alga 600	0.20	2.15	1.93
	Polymixobacterin	No foliar dressing	0.21	2.38	2.11
		Alga 600	0.19	2.18	1.96
	Biophosphorin (Azogran B)	No foliar dressing	0.20	2.07	1.91
		Alga 600	0.20	2.19	2.04
Rizohumin	Control (without application)	No foliar dressing	2.25	4.93	4.76
		Alga 600	2.23	5.34	5.01
	Polymixobacterin	No foliar dressing	2.20	5.18	5.01
		Alga 600	2.23	5.58	5.10
	Biophosphorin (Azogran B)	No foliar dressing	2.27	5.05	4.92
		Alga 600	2.30	5.50	5.06
$LSD_{0.05}$			0.05	0.17	0.11

In the budding stage, plant nitrogen demand was minimal compared to the other growth and developmental stages under study, and therefore, in control treatments, the content of leghemoglobin in lentil nodules was 0.20 mg/g of wet mass and in treatment with Rizohumin 2.25 mg/g of wet mass.

In the flowering stage, the highest content of leghemoglobin in lentil nodules was in the treatments with Rizohumin, phosphate-mobilizing formulation Polymixobacterin and Azogran B in combination with Alga 600, 5.58 and 5.50 mg/g of wet mass.

However, in the stage of beans filling, there was a decrease in the content of leghemoglobin in the lentil nodules, compared with the previous stage. The nodules gradually lost their pink colour, shape, their structure changed, probably due to the destruction of the leghemoglobin nucleus with its conversion to green pigment choleglobin.

Peculiarities of leaf area formation under the effect of components of the agricultural technology through the major phonological stages are shown in table 4.

Table 4 – The leaf area of lentil (m^2/ha) as affected by the components of the agricultural technology, the average for 2017/19

Seed inoculation	Introduction in the row	Foliar dressing	Emergence	Stem formation	Budding	Flowering	Bean filling
Without inoculation	Control (without application)	No foliar dressing	2.4	10.0	19.6	32.0	20.2
		Alga 600	2.4	10.0	19.6	34.4	21.9
	Polymixobacterin	No foliar dressing	2.4	11.1	20.9	35.2	22.9
		Alga 600	2.4	11.1	20.8	36.4	23.4
	Biophosphorin (Azogran B)	No foliar dressing	2.4	11.5	21.5	35.1	23.1
		Alga 600	2.4	11.5	21.3	36.4	23.4
Rizohumin	Control (without application)	No foliar dressing	2.5	12.4	22.1	37.8	22.2
		Alga 600	2.5	12.4	22.1	38.9	24.5
	Polymixobacterin	No foliar dressing	2.5	13.7	23.1	39.1	24.7
		Alga 600	2.5	13.7	23.2	39.9	25.4
	Biophosphorin (Azogran B)	No foliar dressing	2.5	13.9	23.4	39.3	24.6
		Alga 600	2.5	13.9	23.5	40.3	25.0
$LSD_{0.05}$			0.2	0.3	0.4	0.5	0.2

At the time of complete emergence lentil plants formed a rather insignificant leaf area, from 2 400 to 2 500 m^2/ha. However, in the inoculation treatments with Rizohumin, the leaf area was higher by 100 m^2/ha, although the deviations did not exceed experimental error.

During the stage of stem formation, leaf area of 11 100 m^2/ha was formed with Polymixobacterin, and 11 500 m^2/ha with Azogran B. However, seed inoculation with Rizohumin ensured the highest leaf area index, 13 300 m^2/ha and for use in the complex of Polymyxobacterin or Azogran B, respectively, 13 700 and 13 900 m^2/ha.

In the flowering stage, plants formed the maximum leaf area, which on the average in the experiment was 37 100 m^2/ha; however, in the control treatment, it was only 32 000 m^2/ha. Moreover, in the treatment with Rizohumin, Azogran B and Alga 600, lentil plants formed a leaf area of 40 300 m^2/ha.

In the bean filling stage, the leaf area decreased significantly with an average of 23 400 m^2/ha. The better indices, similar to the previous stages, demonstrated the treatments with inoculation and phosphate-mobilizing microorganisms, while the use of Algae 600 in this stage of growth and development did not have a significant effect on the leaf area formation.

Considering the importance of finding the features of nutrients uptake, it is necessary to determine how much nutrients are removed with the harvest. Since the vegetative part of the plants remains in the field and is not processed, we did not take into account the residues of the nutrients in the lentil straw and root residues (table 5).

Table 5 – Removal of the major nutrients with harvest (kg/ha) as affected by the components of the agricultural technology, the average for 2017/19

Seed inoculation	Introduction in the row	Foliar dressing	N	P_2O_5	K_2O
Without inoculation	Control (without application)	No foliar dressing	84.4	28.6	40.0
		Alga 600	92.1	31.2	43.7
	Polymixobacterin	No foliar dressing	100.3	33.9	47.6
		Alga 600	113.3	38.4	53.8
	Biophosphorin (Azogran B)	No foliar dressing	103.3	35.0	49.0
		Alga 600	110.3	37.4	52.3
Rizohumin	Control (without application)	No foliar dressing	99.1	33.6	47.1
		Alga 600	103.2	35.0	49.0
	Polymixobacterin	No foliar dressing	112.7	38.2	53.5
		Alga 600	128.0	43.4	60.8
	Biophosphorin (Azogran B)	No foliar dressing	109.7	37.2	52.1
		Alga 600	118.0	40.0	56.0
$LSD_{0.05}$			2.3	0.7	1.2

In the control treatments, lentil used 84.4 kg/ha of nitrogen, 28.6kg/ha of phosphorus and 40.0 kg/ha of potassium to form the harvest. However, the formation of much higher productivity due to the use of additional agricultural practices also led to an increase in nutrient removal. Therefore, removal of the nutrients in the experiment was the maximum in the treatments with seed inoculation combined with the introduction of phosphate-mobilizing formulation and foliar dressing using Alga 600. Under the combination of Rizohumin, Polymixobacterin and Alga 600, pants needed 128.0 kg/ha of nitrogen, 43.4 kg/ha of phosphorus and 60.8 kg/ha of potassium to form the harvest, however, under the combination of Rizohumin, Azorgan B and Alga 600 they needed 118.0 kg/ha of nitrogen, 40.0 kg/ha of phosphorus and 56.0 kg/ha of potassium. Shown in table 6 are the data on lentil yield as affected by seed inoculation, nitrogen-fixing and phosphate-mobilizing microorganisms and foliar dressing.

Table 6 – Lentil yield (t/ha) as affected by seed inoculation and foliar dressing with plant growth stimulant

Seed inoculation	Introduction in the row	Foliar dressing	Yield (t/ha)
Without inoculation	Control (without application)	No foliar dressing	1.23
		Alga 600	1.33
	Polymixobacterin	No foliar dressing	1.48
		Alga 600	1.70
	Biophosphorin (Azogran B)	No foliar dressing	1.52
		Alga 600	1.65
Rizohumin	Control (without application)	No foliar dressing	1.46
		Alga 600	1.52
	Polymixobacterin	No foliar dressing	1.69
		Alga 600	1.95
	Biophosphorin (Azogran B)	No foliar dressing	1.64
		Alga 600	1.79
$LSD_{0.05}$			0.14

The use of Alga 600 in the budding stage ensured intensive branching of lentil plants, development of more flowers, improved pollination of plants, and uniformity of bean formation. As a consequence, the lentil yield was higher in all treatments of the experiment.

Thus, with the use of nitrogen-fixing (Rizogumin) and phosphate-mobilizing microorganisms (Polymixobacterin and Biophosphorin), lentil yield increased significantly. Combination of Rizohumin + +Azogran B + plant growth stimulator Alga 600 ensured seed yield of 1.79 t/ha, while combined application of Rizohumin + Polymixobacterin + growth promoter Alga 600 resulted in lentil yield of 1.95 t/ha.

Conclusions. Seed inoculation with Rizohumin contributed to 5.3 times larger the number of active nodules in the budding stage, 4.5 times the flowering stage and 3.8 times in the bean-filling stage compared to control and increased active symbiotic potential to 90.8–91.6 % of total symbiotic potential. However, the best indicators of active symbiotic potential were in the treatments with seed inoculation with Rizogumin, and the use of phosphate-mobilizing formulation Polymixobacterin and Azogran B in combination with foliar dressing using Alga 600.

In the flowering stage, the maximum content of leghemoglobin in lentil nodules was in the treatments with Rizohumin, phosphate-mobilizing formulation Polymixobacterin and Azogran B in combination with Alga 600, 5.58 and 5.50 mg/g of wet mass.

Again in the flowering stage, plants formed the maximum leaf area, which on the average in the experiment was 37 100 m^2/ha; in the control treatment, it was only 32 000 m^2/ha. Moreover, in the treatment with Rizohumin, Azogran B and Alga 600, lentil plants formed a leaf area of 40 300 m^2/ha.

Under the combination of Rizohumin, Polymixobacterin and Alga 600, pants needed 128.0 kg/ha of nitrogen, 43.4 kg/ha of phosphorus and 60.8 kg/ha of potassium to form the harvest; however, under the combination of Rizohumin, Azorgan B and Alga 600 they needed 118.0 kg/ha of nitrogen, 40.0 kg/ha of phosphorus and 56.0 kg/ha of potassium.

Combination of Rizohumin + Azogran B + plant growth stimulant Alga 600 ensured seed yield of 1.79 t/ha, while combined application of Rizohumin + Polymixobacterin + Alga 600 resulted in lentil yield of 1.95 t/ha.

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АЗОТ ТҮЗУШІ ЖӘНЕ ФОСФАТ МОБИЛИЗАЦИЯЛАЙТЫН МИКРООРГАНИЗМДЕРДІ ҚОЛДАНУ АРҚЫЛЫ ЖАСЫМЫҚ ДАҚЫЛЫН ҚАЛЫПТАСТЫРУ ЕРЕКШЕЛІКТЕРІ

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ОСОБЕННОСТИ ФОРМИРОВАНИЯ УРОЖАЙНОСТИ ЧЕЧЕВИЦЫ ПОД ВЛИЯНИЕМ АЗОТФИКСИРУЮЩИХ И ФОСФАТМОБИЛИЗИРУЮЩИХ МИКРООРГАНИЗМОВ

Актуальность темы исследования. Получение стабильного и экологически чистого урожая семян чечевицы требует минимального применения минеральных удобрений и других синтетических агрохимикатов. Поэтому изучение особенностей применения азотфиксирующих и фосфатмобилизирующих микроорганизмов и внекорневой подкормки растений и определения вклада этих элементов технологии в формирования продуктивности культуры остается актуальным вопросом.

Цель – изучить особенности формирования продуктивности чечевицы под влиянием применения азотфиксирующих и фосфатмобилизирующих микроорганизмов в условиях Лесостепи Украины.

Методы. Полевой, лабораторный, статистический**.**

Результаты. Доказано, что создание оптимальных условий для роста и развития растений чечевицы сказывается и на формировании колоний клубеньковых бактерий на корневой системе. Так, максимальное количество и масса активных клубеньков на корневой системе чечевицы формировалась в фазу налива бобов – когда и потребность в азоте у растений была максимальна. Инокуляция семян Ризогумином способствовала увеличению количества активных клубеньков в фазу бутонизации в 5,3 раз, в фазу цветения – в 4,5 раз а в фазу налива бобов – в 3,8 раза по сравнению с контролем. Кроме того, при применении фосфатмобилизирующих препаратов и внекорневой подкормки Альга 600 был отмечен рост количества активных клубеньков и их массы в фазу цветения и налива бобов.

Данные определения симбиотического потенциала свидетельствуют о том, что на вариантах без инокуляции Ризогумином в межфазный период бутонизации-цветения общий симбиотическая потенциал был 34,0 тыс. кг суток/га, а активный симбиотический потенциал – 20,3 тыс. кг суток/га, что составляло только 59,6 % от общего. А вот лучшие показатели активного симбиотического потенциала были на вариантах инокуляции семян Ризогумином, и применения фосфатмобилизирующих препаратов Полимиксобактерин и Азогран Б в сочетании с внекорневой подкормкой Альга 600. Кроме того, в фазу цветения, максимальное содержание леггемоглобина в клубеньках чечевицы – 5,58 и 5, 50 мг/г сырой массы клубеньков было на аналогичных вариантах опыта.

В фазу цветения максимальные показатели площади листьев растения чечевицы сформировали на варианте инокуляции Ризогумином, внесении Азограна Б и обработки Альга 600 – 40,3 тыс. $м^2$/га.

Определено, что при применении Ризогумина, Полимиксобактерина и Альга 600 на формирование урожая нужно было 128,0 кг/га азота, 43,4 кг/га фосфора и 60,8 кг/га калия, а вот за внесения Ризогумина, Азоргана Б и Альга 600 соответственно 118,0 кг/га азота, 40,0 кг/га фосфора и 56,0 кг/га калия, что соответствовало максимальным показателям усвоения элементов питания по опыту.

Применение Ризогумина + Азограна Б + стимулятор роста Альга 600 способствовало формированию урожайности семян чечевицы на уровне 1,79 т/га, а в варианте внесения Ризогумин + Полимиксобактерин + стимулятор роста Альга 600 получено максимальные значения - 1,95 т/га.

Ключевые слова: чечевица; инокуляция семян; клубеньковые бактерии; леггемоглобин; симбиотическая потенциал.

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APPLICATION OF MEDICAL AND HYGIENIC AGENTS IN PREVENTION OF LAMENESS AND TREATMENT OF HOOF DISEASES IN COWS

Abstract. Despite the wide range of scientific research on the prevention of lameness and the treatment of hoof diseases of cattle, production trials and implemented treatment methods (antibiotics, sulfonamides, enzymes, immunomodulators, hormones, mud therapy, phyto, magneto, electrotherapy, etc.), many of them are insufficiently effective, expensive, inaccessible or labor-intensive, therefore they cannot be used in dairy farms. The use of antibacterial agents not only did not solve the problems existing in the industry, but also led to the emergence of antibiotic-resistant microbial flora, which put forward new challenges for veterinary science and practice. Under the influence of these preparations, many clinical symptoms and the clinical course of diseases have changed their character, the microbial landscape has changed. Diseases of the hooves are accompanied by lameness and lodging, a decrease in fatness, cows are not bulling for a long time, dryness increases, breeding bulls cannot be used in a random company, which leads to economic damage, therefore the development of affordable and effective means of preventing and treating diseases of hooves in cows is relevant in modern veterinary science and practice.

It was established that the treatment of hooves affected by digital dermatitis with medical and hygienic means against the background of intramuscular injection of biological preparation to cows activates hematopoiesis.

We have tested the medical and hygienic product Espuarol-Gel with a dermatotropic effect and adhesive properties to soft tissues and hooves based on the chelate complex of lanthanide salts in the prevention of lameness and therapy of hoof diseases of cows. It was found that Espuarol-Gel has a more pronounced health-promoting effect in comparison with previously tested agents: $CuSO_4$, Solka, and Espuarol-Sin, providing a bactericidal effect on causative agents of digital dermatitis, expressed in a decrease in the total group score for the state of the limbs, the total lameness score and total diameter of lesions.

The scientific and practical justification of the practicability of the use of the Prevention-N-E biological preparation in the system of measures for the prevention of lameness and treatment of hoof diseases in cows is given.

It was found that trimming the hooves of cows and treating them with CuSO4, Solka, Espuarol-Sin, and Espuarol-Gel against the background of the intramuscular injection of the Prevention-N-E activates the hematological profile of nonspecific resistance of the body, prevents gynecological diseases in the labor and postpartum period implements reproductive and productive qualities.

Key words: cows, lameness, hoof diseases, functional trimming, foot baths, medical and hygienic products.

Introduction. Lameness is a widespread disease throughout the world in dairy herds of cattle. Up to 25% of highly productive cows in a herd can limp at the same time, which causes significant damage, mainly affecting dairy productivity, and leads to financial losses. It has been proved by science and practice that from animals with deformed hooves even without signs of lameness, farms receive less by 4-14% of milk, on average, offspring is reduced by 17%. Also, the farms incur additional costs associated with the purchase of preventive and therapeutic agents and treatment of livestock. Predisposing factors of diseases of the distal extremities, such as adverse living conditions, disturbances in feeding, reduced

nonspecific resistance of the body, inherited abnormalities in the structure of the limbs lead to premature annual culling of 15% of dairy cows [1].

A study of the literary sources and practical experience of many farms to combat hoof diseases in dairy cattle breeding allows us to state that this problem is far from solved and remains one of the most acute in veterinary medicine [2,3].

By the incidence of pathology associated with the distal segment of extremities, they occupy the third place after mastitis diseases and reproduction issues [4]. Mortellaro's disease, pododermatitis, sole ulcer, laminitis, and many other hoof diseases make the veterinarian of any farm shudder at their mention.

A constant high percentage of culling in animals indicates a complex, multifactorial etiology of limb lesion, which has an organizational, infectious and non-infectious nature, and the insufficient effectiveness of the treatment and preventive measures. Therefore, scientists and experts around the world focus on finding medical and hygienic means and methods for the prevention of lameness and the treatment of hoof diseases in cows [4,5,10-19].

The aim of this work is the prevention of lameness and therapy of hoof diseases of cows with the use of medical and hygienic agents against the background of activation of nonspecific resistance of the body with a new generation biological preparation.

Methodology and research methods. The methodology of the work is associated with the study of veterinary hygiene techniques aimed at the prevention of lameness and the treatment of diseases of the hooves in cows, as well as the implementation of their productive qualities; with the development of a machine with a manual drive for fixing and trimming hooves; testing of therapeutic and hygienic products Espuarol-Gel, Espuarol-Sin, Solka and $CuSO_4$ solution of for hygienic care of the hooves of cows; the development of the Prevention-N-E biopreparation and the scheme for its administration to cows to activate the nonspecific resistance of the body. When performing the work, modern research methods were used: zoohygienic, clinical physiological, hematological, biochemical, immunobiological, zootechnical, veterinary and sanitary examinations, spectrometric, biometric and economic. These methods are based on research and assessment of zoohygienic conditions for keeping and feeding cows, hygiene of hoof care, clinical and physiological status, hematological profile and nonspecific resistance of the body, preventive and therapeutic effectiveness of medical and hygiene agents, and productive qualities of cows.

The research work was carried out in the conditions of a model commercial dairy farm of the Autonomous Industrial Complex “Adal” in the Enbekshikazakh district of the Almaty region, materials were processed in the Chuvash Republican Veterinary Laboratory at the Chuvash Republic State Veterinary Service and the laboratory of clinical and hematological research of the Chuvash State Agricultural Academy during 2018 to 2019.

The objects of the research were 5 groups of cows (5 animals in each) of the black-and-white breed of the Sairam intrabreed type, improved by Holstein bulls with various forms of digital dermatitis. Animals of the control group were not treated, 2 times a week, the cows of the 1st experimental group were passed through disinfection baths with 10% aqueous solution of $CuSO_4$, in the treatment of digital dermatitis of the cows of the 2nd, 3rd, and 4th experimental groups, medical and hygienic products Solka, Espuarol-Gel and Espuarol-Sin were used, respectively. Besides, animals of all experimental groups were injected intramuscularly with Prevention-N-E biopreparation at a dose of 10 ml twice with an interval of 10 days with a purpose to increase the nonspecific resistance of the body.

The studies were carried out according to the budget program for 2018 - 2020. Code: BR06349627 "Transfer and adaptation of technologies for the automation of technological processes for the production of milk based on model dairy farms containing 1000 or more dairy cows."

Research results. It was established that the microclimate in the cowshed corresponded to zoohygienic standards. So, the parameters of the air basin in the autumn-winter period in the cowshed had the following values: temperature - 11.5±0.25 °C, relative humidity - 73.4±1.14%, air velocity - 0.3±0.02 m/s, bacterial count - 52.5±1.56 thousand/m^3, ammonia content - 15.7±0.60 mg/m^3, hydrogen sulfide - 6.5±0.26 mg/m^3, carbon dioxide - 0.23±0.01%, dust - 0.9±0.32 mg/m^3. The light coefficient in the premises for cows was 1:14 with the coefficient of natural illumination of 0.83±0.04%.

The main element in milk production technology is the organization of balanced feeding. Feeding conditions for pregnant dry and dairy cows corresponded to the standards and diets of feeding.

The results of hematological studies are presented in table 1.

Table 1 – Hematological data of cows

Group of animals	Observation time, days		Red blood cells, $x10^{12}$/l	Hemoglobin, g/l	Leukocytes, $x10^{9}$/l
	before treatment	after treatment			
Control	7		4.74±0.19	99.2±1.39	12.9±0.20
	14		4.98±0.27	101.8±1.08	11.7±0.44
	28		5.77±0.25	102.4±1.24	10.4±0.42
1 experimental	7		4.76±0.21	100.0±0.84	13.5±0.37
		14	5.99±0.27*	102.8±0.73	10.7±0.47**
		28	6.34±0.28	104.4±1.36	9.4±0.37
2 experimental	7		4.80±0.17	101.0±0.71	12.7±0.37
		14	6.08±0.21*	103.8±0.93	9.9±0.49**
		28	6.49±0.14*	105.4±1.36*	8.3±0.37**
3 experimental	7		4.73±0.19	98.2±1.39	13.2±0.49
		14	6.38±0.27**	107.2±0.98**	9.2±0.49***
		28	7.13±0.15**	108.2±1.24*	7.6±0.32***
4 experimental	7		4.76±0.30*	100.2±1.39	12.9±0.51
		14	6.18±0.07	106.6±1.08*	9.5±0.39***
		28	6.68±0.18*	107.6±1.24*	7.6±0.25***
* P<0.05; ** P<0.01; ** P<0.001.					

The treatment of hooves affected by digital dermatitis with medical and hygienic products against the background of intramuscular injection of biopreparation to cows activates hematopoiesis. Thus, the number of red blood cells in the blood of cows of the 1st, 2nd, 3rd, and 4th experimental groups was higher compared with the control on the 14th day after treating and prophylactic procedures by 20.3%, 22.1, 28.1 and 24.1%. The hemoglobin level in the blood of the cows of the experimental groups was also higher than in the control. It should be noted that the difference between the values of the control and experimental groups was the highest in favor of animals of the 3rd experimental group, in the system of treatment measures of the hoof diseases they used Espuarol-Gel.

In animals of the experimental groups, leukocytosis exceeding the physiological norm was detected before the treatment. In the blood of animals of the experimental groups on the 14th day after treatment, stabilization of the number of leukocytes was noted. At the same time, the amount of the indicated formed element in the blood of animals in the control was higher than in the experimental groups: in the 1st experimental group - by $1.0x10^{9}$/l, in the 2nd - by 1.8, in the 3rd - by 2.5 and in the 4th experimental - at $2.2x10^{9}$/l.

The dynamics of the main hematological indicators of nonspecific resistance of the body of cows are presented in table 2.

Table 2 – Hematological profile of nonspecific resistance of cows

Indicator	Group of animals				
	Control	experimental			
		1st	2nd	3rd	4th
Before treatment					
Phagocytic activity, %	51.0±2.35	51.6±2.50	52.0±2.41	52.2±2.13	51.8±2.23
Phagocytic index	3.9±0.22	3.7±0.31	3.9±0.23	3.5±0.20	3.6±0.18
Lysozyme activity, %	13.0±0.47	13.6±0.38	12.8±0.54	13.4±0.46	13.6±0.44
Bactericidal activity, %	44.3±1.03	46.5±0.98	45.0±1.06	44.4±0.96	44.2±0.84
Immunoglobulins, mg/ml	16.1±0.63	15.6±0.68	14.8±0.71	16.4±0.64	16.0±0.62
14^{th} day					
Phagocytic activity, %	50.4±1.55	52.4±1.58	53.6±1.20	55.8±1.10*	55.2±1.21*
Phagocytic index	3.8±0.15	3.9±0.13	4.1±0.14	4.5±0.18*	4.1±0.16
Lysozyme activity, %	13.4±0.33	14.6±0.37*	15.5±0.36**	18.8±0.30***	17.8±0.31***
Bactericidal activity, %	44.6±0.90	47.7±0.96*	47.6±0.84*	50.7±0.80***	48.8±0.79**
Immunoglobulins, mg/ml	14.3±0.55	17.7±0.47**	18.7±0.51***	20.2±0.56***	19.1±0.51***

					Continuation of table 2
28th day					
Phagocytic activity, %	47.7±1.39	54.3±1.23**	55.7±1.15**	60.8±1.11***	59.6±1.14***
Phagocytic index	3.7±0.12	4.0±0.14	4.3±0.16*	4.8±0.14***	4.4±0.10**
Lysozyme activity, %	14.4±0.32	16.6±0.39**	18.4±0.34**	20.6±0.32**	19.8±0.34**
Bactericidal activity, %	45.7±0.81	50.7±0.76**	51.6±0.75**	54.4±0.74**	52.1±0.72**
Immunoglobulins, mg/ml	14.3±0.49	18.0±0.38**	19.5±0.35**	22.1±0.30**	20.3±0.31**
* P<0.05; ** P<0.01, *** P<0.001.					

Data on the gynecological condition and reproductive qualities of the cows of the experimental groups are presented in table 3.

Table 3 – Incidence and reproductive traits of cows

Indicator	Group of animals				
	control	1 experimental	2 experimental	3 experimental	4 experimental
Number of animals	5	5	5	5	5
Time for the expulsion of the placenta, h	13.5±1.03	11.3±0.68	8.2±0.61**	6.9±0.71***	7.6±0.63**
Retention of placenta	3	–	–	–	–
Subinvolution of uterus	3	1	–	–	–
Endometritis	2	1	–	–	–
Mastitis	2	1	–	–	–
Terms of the onset of 1 estrus, days	53.2±1.51	47.2±1.27*	41.8±1.94**	34.6±1.26***	38.6±1.37***
Insemination index	2.7±0.35	2.3±0.43	1.6±0.20*	1.4±0.19*	1.5±0.18*
Service period, days	109.0±3.16	105.0±2.48	94.2±1.91**	88.4±1.50***	90.6±1.52***
Become impregnated: At 1st insemination	1	2	2	3	2
At 2nd insemination	2	2	2	2	3
At 3rd insemination	2	1	1	–	–
* P<0.05; ** P<0.01, *** P<0.001.					

The complex therapy of hoof diseases in cow with the medical-hygienic products like Solka and Espuarol-Sin, as well as the $CuSO_4$ solution tested earlier, and Espuarol-Gel, tested for the first time, against the background of the intramuscular injection of the Prevention-N-E biological preparation, helped to reduce the time of the expulsion of the placenta and prevented gynecological diseases. After the application of the Prevention-N-E biological preparation, the terms of the onset of estrus, the insemination index and the service period were reduced in animals, as well as the fertility rate at the 1st insemination. The obtained data are consistent with the research of Kazakhstani scientists in the Bayserke-Agro conditions regarding the prevention of gynecological diseases and increasing the productivity of cows [7,8,9].

In such a way, the treatment of the hooves in cows affected by digital dermatitis with the Solka and Espuarol-Sin hygienic means, as well as the CuSO4 solution tested earlier, and the Espuarol-Gel tested for the first time, against the background of the intramuscular injection of the Prevention-N-E at a dose of 10 ml, twice with an interval of 10 days, prevented gynecological diseases in the labor and postpartum periods and increased the reproductive function of the body with a more pronounced effect by Espuarol-Gel.

Indicators of dairy productivity of cows are given in table 4.

Table 4 – Indicators of dairy productivity of cows

Indicator	Group of animals				
	control	1 experimental	2 experimental	3 experimental	4 experimental
Number of animals	5	5	5	5	5
Milk yield for 305 days of lactation, kg	4656±85.91	4880±70.49	5073±62.58**	5500±62.84***	5430±62.89***
Average fat content in milk, %	3.87±0.03	3.90±0.04	3.96±0.02*	4.03±0.02**	4.0±0.01**
Protein content in milk, %	3.04±0.01	3.05±0.01	3.06±0.01	3.08±0.005**	3.06±0.01
* P≤0.05; ** P≤0.01; *** P≤0.001.					

The treatment of the hooves in cows affected by digital dermatitis with $CuSO_4$, Solka, previously tested Espuarol-Sin, and tested for the first time Espuarol-Gel, against the background of activation of nonspecific resistance of the organism with the Prevention-NE biological preparation, contributed to the realization of the bioresource potential of dairy productivity and improvement of organoleptic, physicochemical and microbiological indicators of raw milk that meet the requirements of TR CU 033/2013 Technical Regulations of the Customs Union “On the safety of milk and dairy products”, GOST 31449-2013 “Raw cow's milk. Technical conditions."

It was established that the data on the total group score for the state of the limbs of animals in tested groups at the beginning and the end of the experiment varied significantly. It should be noted that in the control group and the group with the use of $CuSO_4$ baths, the extremities state worsened +126 points (79.4%) and +62 points (35.4%), respectively. In the 2nd, 3rd and 4th experimental groups with the use of Solka, Espuarol-Gel and Espuarol-Sin gels, the state improvement of the limbs was noted, which in the point system was expressed in a decrease of 184 points (63.2%), 211 points (80.8%) and 192 points (71.9%), respectively.

It was found that in the control and 1st experimental group of cows, the degree of lameness was raised by +7 points (77.7%) and +2 points (15.3%), respectively. In groups with Solka, Espuarol-Gel and Espuarol-Sin gels, a decrease in the degree of lameness occurred by 6 points (35.3%), 8 points (47.0%) and 5 points (33.3%), respectively.

In the control group and the 1st experimental group with the application of $CuSO_4$ baths, there was an increase in the total diameter of the affected areas with digital dermatitis by +11 mm (7.7%) and +3 mm (2.3%), respectively. In the 2nd, 3rd and 4th experimental groups using Solka, Espuarol-Gel, and Espuarol-Sin gels, there was noticed a reduction in this indicator by 61 mm (31.7%), 69 mm (36.9%) and 62 mm (32.8%), respectively.

In this connection, the research of the comparative effectiveness of medical and hygienic products in the prevention of lameness and therapy of the hoof diseases of cow revealed a more pronounced therapeutic effect of the Espuarol-Gel, tested for the first time, which provides a bactericidal effect on causative agents of the hoof diseases in cows, which is expressed in a decrease in the total group score of the limb state by 8.9%, the total lameness score by 13.7%, the total diameter of affection by 4.1%, than, for example, of the Espuarol-Sin.

Conclusion. We offer the system of veterinary-hygienic methods for the prevention and treatment of hoof diseases in cows, which provides for hygiene of keeping, feeding, and management, functional trimming of the hooves by the Dutch flat method on a developed tool with manual drive and the use of medicinal and hygienic product Espuarol-Gel, with dermatotropic effect and adhesive properties to soft tissues and ungulate horn based on the chelate complex of lanthanide salts.

To activate the nonspecific resistance of the body, to realize the bioresource capacity of the reproductive and productive qualities of cows, we recommend intramuscularly injecting the Prevention-N-E biological preparation at a dose of 10 ml, twice with an interval of 10 days.

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СИЫРДЫҢ БАҚАЙ АУРУЫ МЕН АҚСАУЫНА ТЕРАПИЯЛЫҚ ЕМДІК-ГИГИЕНАЛЫҚ ҚҰРАЛДАРДЫ ҚОЛДАНУ

Аннотация. Ірі қара сауын малдарының арасындағы ақсақтық бүкіл әлем бойынша кең таралған. Жоғарғы өнімді табын сиырларының бір мезгілде 25% ақсаңдайды әрі бұл жағдай сүт өнімінің құнарлылығына айтарлықтай зиян келтіреді және қаржылық шығынға алып келеді. Ғылым мен практика, тіпті, ақсаңдау белгісі болмаса да, деформацияланған тұяқты малдан шаруашылық сүттің 4-14% алмайтындығы, орташа алғанда, төлдің 17%-ға азаятындығы дәлелдеген. Сонымен қатар, шаруашылықтар мал басын емдеу және аурудың алдын алу мақсатында құралдарды сатып алуға байланысты қосымша шығын көтереді.

Осы жұмыстың мақсаты ақсақтықтың алдын алу және жаңа буын биологиялық дәрмектің көмегімен ағзаның сипатты емес төзімділігі белсенділігінің аясында, емдік-гигиеналық құралдарды қолдану арқылы сиыр тұяғы ауруларын емдеу болып саналады.

Ғылыми-зерттеу жұмысы Алматы облысы Еңбекшіқазақ ауданындағы «Адал» АӨК АҚ-ның модельдік сүтті-тауарлы фермасында орындалды, материалдарды өңдеу 2018-2019 жж. аралығында «Чуваш Республикалық ветеринарлық зертханасы» ЧР БМ Мемветқызметі және Чуваш ГСХА-дағы ФГБОУ клиникалық-гематологиялық зерттеулер зертханасында жүзеге асырылды.

Зерттеу нысандары ретінде саусақ терісінің қабынуы зақымдануының әр алуан түрлері бар голштин тұқымдас бұқалары негізінде жақсартылған «Сайрам» тұқымішілік үлгідегі қарала тұқымдас сиырлардың 5 тобы (әрқайсысында 5-тен) алынды. Бақылау тобындағы малдарға ем қолданылған жоқ, 1-тәжірибелі топтағы сиырлар аптасына 2 рет құрамында 10% CuSO4 су ерітіндісі бар дезинфекциялық ванна арқылы жіберілді, 2, 3 және 4-тәжірибелі топтардың саусақ дерматитінің терапиясында Solka, Espuarol-Gel және Espuarol-Sin емдік-гигиеналық құралдары қолданылды. Сонымен қатар, барлық тәжірибелі топтағы мал ағзаларының сипатты емес төзімділігін арттыру мақсатында Prevention-N-E биодәрмегі 10 мл мөлшерде екі реттен 10 күн аралығымен инъекцияланды.

Суалған буаз және сауын сиырларын азықтандыру жағдайлары азықтандыру нормалары мен мөлшерлеріне сәйкес келді.

Саусақ терісінің қабынуымен зақымданған тұяқтарды бұлшықетішілік инъекция аясында емдеу-гигиеналық құралдармен өңдеу қан түзілуді қарқындататыны анықталды. Сол арқылы 1, 2, 3 және 4-тәжірибелі топтағы сиырлар қанындағы эритроциттер саны емдеу-профилактикалық манипуляциядан кейінгі 14-тәуліктегі бақылаумен салыстырғанда 20,3%, 22,1, 28,1 және 24,1%-ға жоғары болды. Тәжірибелі топтағы сиырлардың қанындағы гемоглобин деңгейі де бақылаудағы деңгейге қарағанда жоғары болды. Бақылау және тәжірибе топтарының деректері арасындағы айырмашылық Espuarol-Gel қолданылған тұяқ ауруларын емдеу жөніндегі іс-шаралар жүйесінде 3-тәжірибелі топтың жануарларында ең жоғары болып анықталғанын атап өткен жөн.

Тәжірибелік топтағы жануарларда емге дейінді кезеңде физиологиялық нормадан асатын лейкоцитоз анықталды. Тәжірибелі топтағы жануарлардың қанында емнен кейінгі кезеңнің 14-тәулігінде қандағы лейкоциттер санының тұрақтануы байқалды. Бұл ретте бақылаудағы жануарлардың қанында көрсетілген қан түйіршіктерінің саны тәжірибелік топтардан жоғары болды: 1-тәжірибелі топта – 1, 0х109/л, 2-топта – 1,8, 3-топта – 2,5 және 4-тәжірибелі топта – 2, 2х109/л.

Тәжірибелі топ сиырлары қанының иммундық-биологиялық көрсеткіштері бақылау тобына қарағанда жоғары екені анықталды: сәйкесінше, лейкоциттердің фагоцитарлық белсенділігі – 2,0-5,4 %, плазманың лизоцимдік белсенділігі –1,2-5,4%, қан сарысуының бактерицидтік белсенділігі – 3,1 – 6,1% және иммуноглобулиндер құрамы – 3,4 – 5,9 мг/мл. Яғни, тұяқтарды Solka және Espuarol-Sin емдік-гигиеналық құралдарымен, сондай-ақ бұрын сынақтан өткен CuSO4 ерітіндісімен және алғаш рет сыналған Espuarol-Gel-мен өңдеу аясында Prevention-N-E биодәрмегін сиырлардың бұлшықет ішіне енгізу имуноглобулиндердің синтезін жандандырады.

Тұяқтарды Solka және Espuarol-Sin емдік-гигиеналық құралдарымен, сондай-ақ бұрын сынақтан өткен CuSO4 ерітіндісімен және алғаш рет сыналған Espuarol-Gel- мен өңдеу, Prevention-N-E биодәрмегін сиырлардың бұлшықет ішіне енгізу түрінде көрініс тапқан кешенді емдеу мал шуының бөліну мерзімінің қысқаруына ықпал етті және гинекологиялық аурулардың алдын алды. Prevention-N-E биодәрмегін

қолданғаннан кейін сиырларда жыныстық құмарлықтың пайда болу мерзімдері, ұрықтандыру көрсеткіші және күйек мерзімі қысқарды.

Сол арқылы, саусақ терісінің қабынуы арқылы зақымданған сиыр тұяқтарын Solka және Espuarol-Sin емдік-гигиеналық құралдарымен, сондай-ақ бұрын сынақтан өткен CuSO4 ерітіндісімен және алғаш рет сыналған Espuarol-Gel- мен өңдеу, Prevention-N-E биодәрмегін 10 мл мөлшерде екі реттен 10 күн аралығымен инъекциялау Espuarol-Gel-дің айтарлықтай айқын әсер беруі кезінде босану және босанғаннан кейінгі кезеңдегі гинекологиялық аурулардың алдын алып, ағзаның қалпына келтіру қызметін арттырды.

Саусақ терісінің қабынуымен зақымданған сиыр тұяқтарын Solka және Espuarol-Sin емдік-гигиеналық құралдарымен, сондай-ақ бұрын сынақтан өткен CuSO4 ерітіндісімен, ағзаның Prevention-N-E биодәрмегінің сипатты емес төзімділігін жандандыру аясында алғаш рет сыналған Espuarol-Gel-мен өңдеу сүт өнімділігінің биоресурстық әлеуетін іске асыруға және КО ТР 033/2013 талаптарына жауап берген шикі сүттің органолептикалық, физикалық-химиялық және микробиологиялық көрсеткіштерін жақсартуға ықпал етті. Кеден одағының «Сүттің және сүт өнімдерінің қауіпсіздігі туралы» техникалық регламенті, МЕМСТ 31449-2013 «Шикі сиыр сүті. Техникалық шарттар».

Жиынтық топтық ұпай жөніндегі деректер бойынша тәжірибелік топтағы жануарлардың аяғында тәжірибенің басы мен соңында айтарлықтай өзгешеліктер болғаны анықталды. Бақылау тобында және құрамындағы CuSO4 ванналарды қолданған топта аяқтың нашарлауы +126 ұпай (79,4%) және +62 ұпай (35,4%) сәйкесінше болғанын атап өту қажет. Solka, Espuarol-Gel және Espuarol-Sin гельдерін қолдана отырып 2, 3 және 4- тәжірибелі топтарда аяқтың жақсарғаны байқалды, бұл баллдық жүйеде тиісінше 184 балға (63,2%), 211 балға (80,8%) және 192 балға (71,9%) төмендегенін білдіреді.

Сиырлардың бақылау және 1-тәжірибелі тобында ақсаңдау деңгейі тиісінше +7 балға (77,7%) және +2 балға (15,3%) артқаны анықталды. Solka, Espuarol-Gel және Espuarol-Sin гельдерін қолданған топтарда хромот дәрежесі 6 балға (35,3%), 8 балға (47,0%) және 5 балға (33,3 %) төмендеді.

Бақылау тобында және 1-тәжірибелік топта CuSO4 ванналарын қолдану арқылы саусақ терісінің қабынуы арқылы зақымданған аймақтарының жиынтық диаметрінің сәйкесінше +11 мм (7,7%) және +3 мм (2,3%) ұлғайғаны анықталды. Solka, Espuarol-Gel және Espuarol-Sin гельдерін қолдана отырып 2, 3 және 4-тәжірибелі топтарда көрсетілген көрсеткіштің 61 мм (31,7%), 69 мм (36,9%) және 62 мм (32,8 %) төмендегені байқалды.

Осылайша, ақсақтықтың алдын алу және сиыр тұяғының ауруларын емдеуде емдеу-гигиеналық құралдардың салыстырмалы тиімділігін зерттеу арқылы алғаш рет апробациялаған Espuarol-Gel препаратының анағұрлым айқын терапиялық әсері анықталды, ол аяқ-қолдың жағдайын жиынтық топтық бағалаудың 8,9%-ға, хромотаның жиынтық балының 13,7%-ға, зақымданудың жиынтық диаметрінің 4,1%-ға төмендеуінен көрінетін сиыр тұяқтары ауруларының қоздырғыштарына бактерицидтік әсерді қамтамасыз етеді.

Түйін сөздер: сиырлар, ақсақтық, тұяқ аурулары, функционалдық кесу, аяқ ванналары, емдеу-гигиеналық құралдар.

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ПРИМЕНЕНИЕ ЛЕЧЕБНО-ГИГИЕНИЧЕСКИХ СРЕДСТВ В ПРОФИЛАКТИКЕ ХРОМОТЫ И ТЕРАПИИ ЗАБОЛЕВАНИЙ КОПЫТЕЦ КОРОВ

Аннотация. Во всем мире в дойных стадах крупного рогатого скота широко распространена хромота. До 25 % высокопродуктивных коров стада могут хромать одновременно, что наносит значительный ущерб, отражающийся главным образом на молочной продуктивности, и приводит к финансовым потерям. Наукой и практикой доказано, что от животных, имеющих деформированные копытца даже без признаков хромоты, хозяйства недополучают 4–14 % молока, в среднем на 17% уменьшается приплод. К тому же хозяйства несут дополнительные расходы, связанные с приобретением профилактических и терапевтических средств и лечением поголовья.

Целью настоящей работы является профилактика хромоты и терапия заболеваний копытец коров с применением лечебно-гигиенических средств на фоне активизации неспецифической резистентности организма биопрепаратом нового поколения.

Научно-исследовательская работа выполнена в условиях модельной молочно-товарной фермы АР АПК «Адал» Енбекшиказахского района Алматинской области, обработка материалов осуществлена в БУ ЧР «Чувашская республиканская ветеринарная лаборатория» Госветслужбы ЧР и в лаборатории клинико-гематологических исследований ФГБОУ ВО Чувашская ГСХА в период с 2018 по 2019 гг.

Объектами исследований были 5 групп коров (по 5 в каждой) черно-пестрой породы внутрипородного типа «Сайрам», улучшенные быками голштинской породы с различными формами поражения пальцевым дерматитом. Животным контрольной группы не применялось лечение, коров 1-й опытной группы 2 раза в неделю пропускали через дезванны с 10% водным раствором $CuSO_4$, в терапии пальцевого дерматита коров 2-й, 3-й и 4-й опытных групп использовали лечебно-гигиенические средства Solka, Espuarol-Gel и Espuarol-Sin соответственно. Кроме того, животным всех опытных групп внутримышечно инъецировали биопрепарат Prevention-N-E в дозе 10 мл двукратно с интервалом 10 дней с целью повышения неспецифической резистентности организма.

Условия кормления стельных сухостойных и дойных коров соответствовали нормам и рационам кормления.

Установлено, что обработка копытец, пораженных пальцевым дерматитом, лечебно-гигиеническими средствами на фоне внутримышечной инъекции коровам биопрепарата, активизирует гемопоэз. Так, количество эритроцитов в крови коров 1-й, 2-й, 3-й и 4-й опытных групп было выше по сравнению с контролем на 14-е сутки после лечебно-профилактических манипуляций на 20,3 %, 22,1, 28,1 и 24,1 %. Уровень гемоглобина в крови коров опытных групп тоже оказался выше, нежели в контроле. Следует отметить, что разница между данными контрольной и опытных групп оказалась наивысшей в пользу животных 3-й опытной группы, в системе мероприятий по терапии болезней копытец, которых использовали Espuarol-Gel.

У животных подопытных групп до лечения выявлен лейкоцитоз, превышающий физиологическую норму. В крови животных опытных групп на 14-е сутки после лечения отмечена стабилизация количества лейкоцитов в крови. При этом количество указанного форменного элемента в крови животных в контроле было выше, нежели в опытных группах: в 1-й опытной группе – на $1{,}0x10^9$/л, во 2-й – на 1,8, в 3-ей – на 2,5 и в 4-ой опытной – на $2{,}2x10^9$/л.

Установлено, что иммунобиологические показатели крови коров опытных групп оказались выше, нежели в контроле: фагоцитарная активность лейкоцитов – на 2,0 – 5,4 %, лизоцимная активность плазмы – 1,2 – 5,4 %, бактерицидная активность сыворотки крови – 3,1 – 6,1 % и содержание иммуноглобулинов – 3,4 – 5,9 мг/мл соответственно. То есть внутримышечное введение коровам биопрепарата Prevention-N-E активизирует синтез иммуноглобулинов, на фоне обработки копытец лечебно-гигиеническими средствами Solka и Espuarol-Sin, а также раствором $CuSO_4$, апробированных ранее, и Espuarol-Gel, испытуемого впервые.

Комплексная терапия заболеваний копытец коров лечебно-гигиеническими средствами Solka и Espuarol-Sin, а также раствором $CuSO_4$, апробированными ранее, и Espuarol-Gel, испытуемым впервые, на фоне внутримышечной инъекции биопрепарата Prevention-N-E способствовала сокращению сроков отделения последа и предупреждала гинекологические заболевания. После применения биопрепарата Prevention-N-E у коров сокращались сроки наступления половой охоты, индекс осеменения и сервис-период, а также повышалась оплодотворяемость при 1 осеменении.

Таким образом, обработка копытец коров, пораженных пальцевым дерматитом, лечебно-гигиеническими средствами Solka и Espuarol-Sin, а также раствором $CuSO_4$, апробированными ранее, и Espuarol-Gel, испытуемым впервые, на фоне внутримышечной инъекции биопрепарата Prevention-N-E в дозе 10 мл, двукратно с интервалом 10 суток, предупреждала гинекологические заболевания в родовой и послеродовой периоды и повышала воспроизводительную функцию организма, при более выраженном эффекте Espuarol-Gel.

Обработка копытец коров, пораженных пальцевым дерматитом, лечебно-гигиеническими средствами $CuSO_4$, Solka, Espuarol-Sin, апробированными ранее, и Espuarol-Gel, испытуемым впервые, на фоне активизации неспецифической резистентности организма биопрепаратом Prevention-N-E, способствовала реализации биоресурсного потенциала молочной продуктивности и улучшению органолептических, физико-химических и микробиологических показателей сырого молока, которые отвечали требованиям ТР ТС 033/2013 Технический регламент Таможенного союза «О безопасности молока и молочной продукции», ГОСТ 31449-2013 «Молоко коровье сырое. Технические условия».

Установлено, что данные по суммарной групповой бальной оценке состояния конечностей животных подопытных групп на начало и конец опыта существенно разнились. Необходимо отметить, что в контрольной группе и в группе с применением ванн с $CuSO_4$ происходило ухудшение состояния конечностей +126 баллов (79,4%) и +62 балла (35,4%) соответственно. Во 2-й, 3-й и 4-й опытных группах с применением

гелей Solka, Espuarol-Gel и Espuarol-Sin отмечено улучшение состояния конечностей, что в бальной системе выражалось в снижении на 184 балла (63,2%), 211 баллов (80,8%) и 192 балла (71,9%) соответственно.

Установлено, что в контрольной и 1-й опытной группе коров повышалась степень хромоты на +7 баллов (77,7%) и +2 балла (15,3%) соответственно. В группах с применением гелей Solka, Espuarol-Gel и Espuarol-Sin произошло снижение степени хромоты на 6 баллов (35,3%), 8 баллов (47,0%) и 5 баллов (33,3 %) соответственно.

Установлено, что в контрольной группе и 1-й опытной группе с применением ванн с $CuSO_4$ происходило увеличение суммарного диаметра пораженных участков пальцевым дерматитом на +11 мм (7,7%) и +3 мм (2,3%) соответственно. Во 2-й, 3-й и 4-й опытных группах с применением гелей Solka, Espuarol-Gel и Espuarol-Sin отмечено снижение указанного показателя на 61 мм (31,7%), 69 мм (36,9%) и 62 мм (32,8 %) соответственно.

Таким образом, изучением сравнительной эффективности лечебно-гигиенических средств в профилактике хромоты и терапии заболеваний копытец коров выявлен более выраженный терапевтический эффект препарата Espuarol-Gel, апробированного нами впервые, который обеспечивает бактерицидное действие на возбудителей болезней копытец коров, выражающийся в уменьшении суммарной групповой оценки состояния конечностей на 8,9 %, суммарного балла хромоты на 13,7%, суммарного диаметра поражений на 4,1%, нежели, к примеру, Espuarol-Sin.

Ключевые слова: коровы, хромота, болезни копытец, функциональная обрезка, ножные ванны, лечебно-гигиенические средства.

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INFLUENCE OF COW SKIN CLEANING ON PHYSIOLOGICAL PARAMETERS UNDER HEAT STRESSES IN WARM SEASON

Abstract. The results of the research on reducing heat stress in cows arising at temperatures above 25 °C by enhancing the intensity of heat transfer between animal and environment in the warm season by reducing skin contamination with various cleaning methods are considered.

The article presents analytical expressions that establish the dependence of the influence of environmental parameters on the heat transfer of an animal. Analytical expressions connect the clinical and physiological parameters of animals: skin temperature, heart rate, respiration rate with environmental parameters: temperature, relative humidity, and air flow rate; the expressions also take into account the condition of the skin and cleaning methods.

The study hypothesizes that after cleansing the skin of animals during the warm and hot season, the intensity of heat transfer between the animal and the environment will increase from pollution, which will allow the animal to more effectively remove excess heat from the body.

The research methodology is based on the determination of the clinical and physiological parameters of animals with various methods of cleaning the skin: skin temperature, respiratory rate, and heart rate of animals.

The studies have shown that the respiratory rate in animals after dry cleaning is less by 6.08% than in animals that did not receive skin cleansing. With wet cleaning, the difference is 9.63%; the heart rate in animals after dry cleaning is less by 4.45% than in animals that have not received cleansing of the skin. With wet cleaning, the difference is 12.95%; as a result of wet cleaning, the skin area has a temperature lower on average by 11.85% than the untreated skin area, whereas after dry cleaning the difference is 2.51%.

The results suggest that the use of wet cleaning of cow skin in the warm season is more effective than dry cleaning.

Key words: cows, heat stress, skin, dry cleaning, wet cleaning.

Introduction. The creation and maintenance of comfortable conditions for keeping cows is a prerequisite for increasing the efficiency of milk production on farms. For example, the upper critical air temperature for lactating cows is in the range from plus 24 ° C to plus 27 ° C [1]. However, critical temperatures vary depending on several factors, including the degree of acclimatization, physical condition, pregnancy, movement of air around animals, and relative humidity [2]. The studies have shown that the use of technical means can reduce the effect of heat stress. The practice has shown that at ambient temperatures above 25 °C, convective heat loss is markedly reduced, and heat extraction mainly depends on the water evaporation from the skin surface and upper respiratory tract. The use of forced ventilation contributed to an increase in heat loss by animals in summer, which effectively reduced the growth of physiological parameters of a cow with increasing air temperature, resulting in increased dairy productivity [3]

The modern scientific and technological advances allow more efficient use of the facility and maintain comfortable conditions at livestock enterprises [4].

So the use of forced ventilation (2.25 m/s) during the hot season, compared with natural ventilation (0.23 m/s), allowed to reduce the respiratory rate, the body temperature of cows, increase the time that the cows were lying, and also reduce the concentration of carbon dioxide and ammonia in the air [5]. The use of evaporative cooling can also lead to a positive effect on reducing heat stress [6].

Based on the clinical and physiological parameters of animals, it is possible to evaluate the reaction of the cow's organism to the influence of the environment, including in premises [7,8].

Particular attention should be paid to the condition of the cow skin, which constantly interacts with the environment, especially, it is involved in heat transfer. As a result of the natural processes of the life of cows, in most cases, contamination of the skin occurs. The nature of the contamination can vary and depend on the method of keeping animals, as well as environmental conditions. Contamination of the skin affects the appearance of pathogenic microorganisms and cutaneous parasites [9]. Inadequate skin care of animals leads to contamination and blockage of the sweat glands of cows, irritation of the skin, and deterioration of the thermoregulatory function [10].

Therefore, the research on various cleaning methods of the skin is an important issue of keeping animals. The solution to this problem is especially important in the warm and hot season when the environmental conditions for heat transfer through heat conductivity, convection, or by radiation are less favorable than in the colder period. In this case, special attention should be paid to heat transfer due to evaporation.

With a detailed examination of the cow skin, the following characteristics can be distinguished that affect the heat transfer in general and its individual kinds in particular: length and diameter of hair, the distance between hairs (figure 1). Also, contamination of the skin, which can be divided into natural - the secretion of the sebaceous glands, exfoliated horn cells, and the external - dust, dirt, animal waste products, affects heat transfer.

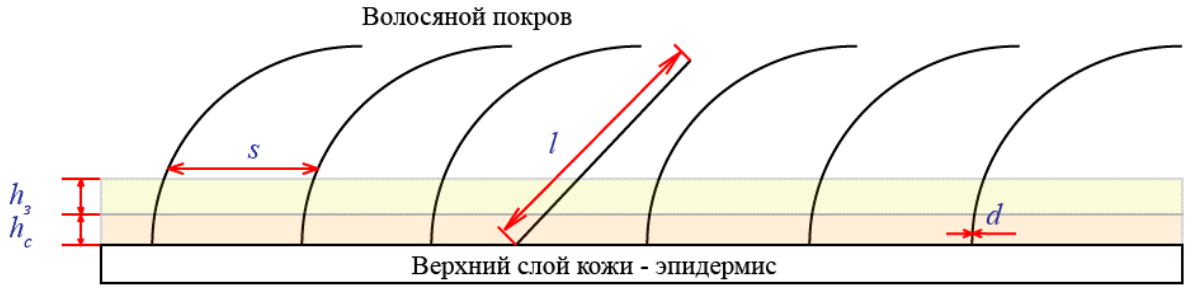

Figure 1 – Characteristics of the skin. (*s* - the distance between hairs, *l* - hair length, *d* - hair diameter, h_c - thickness of natural contamination layer, $h_э$ - thickness of external contamination layer).
Волосяной покров – hair; Верхний слой кожи – эпидермис - epidermis

Given the listed characteristics of the skin, we can express the function that determines the degree of skin contamination:

$$\Omega = \{h_c, h_э, s, l, d, K_c, K_э\} \quad (1)$$

where $h_э$ – thickness of external contamination layer, м; h_c – thickness of natural contamination layer, м; *s* – the distance between hairs, м; *l* – hair length, м; *d* – hair diameter, м; K_c – coefficient of natural contamination; K_3 – coefficient of external contamination.

Coefficients of contamination K_c and K_3 are integral characteristics describing the physical and chemical properties of the corresponding layer of skin contamination.

Analytical expressions establishing the dependence of the influence of environmental parameters on the heat transfer of animal can be represented as:

$$\begin{cases} F_T = \{\nu_д, \nu_n, t_m, t_{к.п}, t_в, \varphi, V_в, Q_K, Q_Л, Q_И, K_{CO}, K_{ВП}, K_c, K_з, \tau\} \\ Q_K = K_c K_з K_{со} K_{ВП} \beta\beta_1 \sqrt[4]{t_{к.п.} - t_в + 60\frac{V_в^2}{l}} (t_{к.п} - t_в) F_{об} \\ Q_Л = K_c K_з K_{со} K_{ВП} \varepsilon_{пр} C_0 \left[0{,}81 + 0{,}005(t_{к.п.} + t_в)\right](t_{к.п.} - t_в) F_{об} \\ Q_И = K_c K_з K_{со} K_{ВП} \beta\beta_1 \sqrt[4]{t_{к.п.} - t_в + 60\frac{V_в^2}{l_n}} (c_1 - c_2) \frac{101{,}3 \cdot 10^3}{\rho c_p P_б} F_{об} \\ \Omega = \{h_c, h_з, s, l, d, K_c, K_з\} \end{cases} \quad (2)$$

where F_T – animal heat-sensing function; $\nu_д$ – respiratory rate, min^{-1}; ν_n – heart rate, min^{-1}; t_m – cow's body temperature, ^{o}C; $t_{к.п}$ – skin temperature, ^{o}C; $t_в$ – premises air temperature, ^{o}C; φ - relative humidity, %; $V_в$ – air flow rate, m/s; Q_K – convection heat transfer, W; $Q_Л$ – radiation heat transfer, W; $Q_И$ – evaporation heat transfer, W; K_{CO} – coefficient taking into account the method of cleaning the skin; $K_{ВП}$ – coefficient of hair; τ - exposure time, s; $F_{об}$ – total surface area of the skin of the animal, m^2; β, β_1 – coefficients of surface heat transfer, W/m^{2o}C; l_n – characteristic surface size, m; $\varepsilon_{пр}$ – given emissivity coefficient of the skin surface and the inner surfaces of the fencing; C_0 – emissivity of a completely black surface, W/m^{2}K^4; c_1 – concentration of surface water vapor at 100% saturation and liquid surface temperature, kg/m^3; c_2 – concentration of water vapor in ambient air, кг/м^3; c_p – specific heat capacity of the matter, J/kg ·°C; $P_б$ – barometric pressure of moist air, Pa; ρ – fluid density, kg/m^3.

The aim of the research. Estimation of the influence of the cleaning method of the cow skin on the intensity of heat transfer between the animal and the environment in the warm season, by reducing skin contamination.

Materials and methods. The hypothesis of the study is that, after cleansing the animal skin during the warm and hot seasons, the intensity of heat exchange between the animal and the environment will increase with the help of contamination, it will make it possible for the animal to more effectively remove excess heat from the body.

According to numerous investigations, data have been confirmed that, with heat stress, cows have a higher respiratory rate and pulse. These changes are due to the peculiarities of the thermoregulation of animals [8].

The research techniques are based on the determination of the clinical and medical parameters of animals with various methods of skin cleaning: skin temperature, respiratory rate, and heart rate of animals.

The data were obtained at the dairy farm of the zoo station RSAU-MAA named after K.A. Timiryazev. The study includes a group of 10 animals selected according to the equal criteria (age, weight, number of calving, animal health status). The research was carried out in a climate chamber at temperatures of 20... 30 °C and relative air humidity of 50... 80% in several stages.

The first stage of the study is without cleaning the skin.

The second stage is after the dry cleaning of the skin.

The third stage is after the wet cleaning of the skin.

At every stage, there were taken measurements of the skin temperature, respiratory rate, and heart rate of cows at various temperatures and relative humidity.

At the second stage, before measurements, the skin was dry cleaned using a brush (scraper). At the third stage, before taking measurements, the skin was wet cleaned using a brush (scraper) and a detergent based on a soap solution.

The data on the average skin temperature over several areas of the skin are recorded. After cleaning the skin areas, measurements of the skin temperature are taken after 20 minutes to avoid the friction effect

during dry cleaning and the cooling effect due to evaporation during wet cleaning. Measurements of the skin temperature are made within 40 minutes, with an interval of 5 minutes

Research results. The selected areas of the skin are prepared and cleaned. The conditions in the climate chamber are with ambient air temperature from 20.0 °C to 30.0 °C in increments of 5.0 °C, relative humidity from 50.0% to 80.0% in increments of 10%, air flow rate about - 0.2 m/s, atmospheric pressure 746 mm. Hg., exposure to direct sunlight on the skin is absent.

The temperature of each skin area is determined by a non-contact method using a pyrometer (figure 2).

The results of measuring the respiratory rate in animals are obtained. The results are presented in figure 3.

The investigations have shown that the respiratory rate in animals after dry cleaning is less by 6.08% than in animals that did not receive skin cleansing. With wet cleaning, the difference is 9.63%.

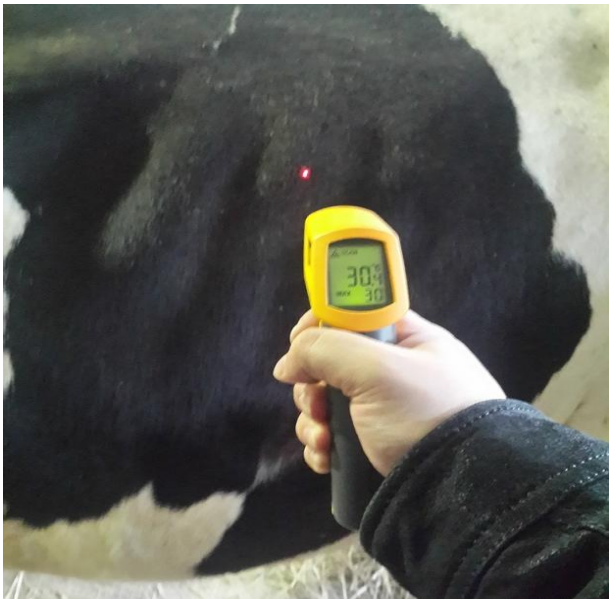

Figure 2 – Measurement of the skin temperature of a cow during various cleaning methods.

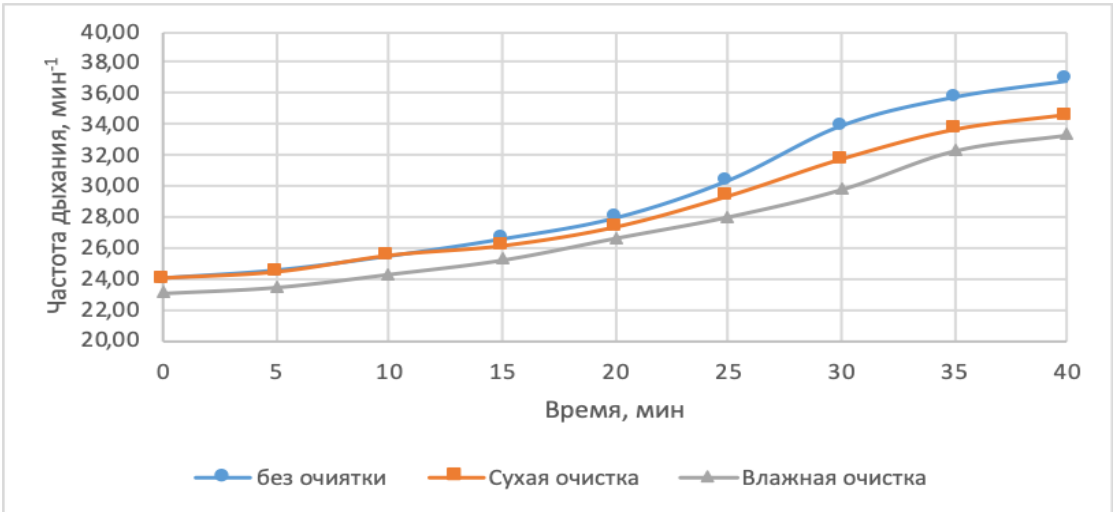

Figure 3 – Change in respiratory rate during various cleaning methods
Частота дыхания, мин$^{-1}$ - respiratory rate, min^{-1}; Время, мин – Time, min;
Без очистки – without cleansing; Сухая чистка – dry cleaning; Влажная чистка – wet cleaning

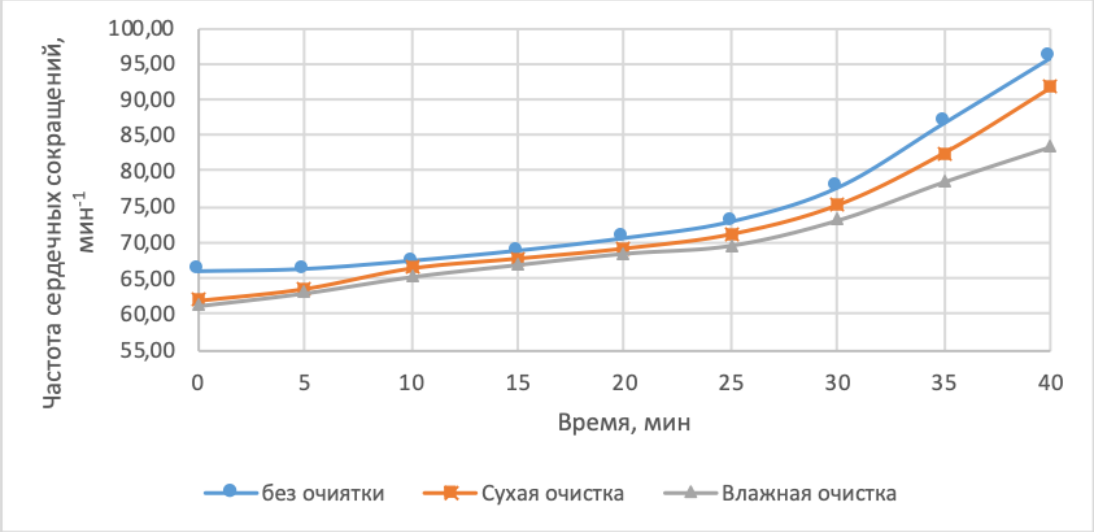

Figure 4 – Change in heart rate during various types of cleaning.
Частота сердечных сокращений, мин$^{-1}$ - heart rate, min^{-1}; Время, мин – Time, min;
Без очистки – without cleansing; Сухая чистка – dry cleaning; Влажная чистка – wet cleaning

The studies have shown that the heart rate in animals after dry cleaning is less by 4.45% than in animals without skin cleansing. With wet cleaning, the difference is 12.95%.

The temperature of each area is observed for 40 minutes. The results are presented in figure 5.

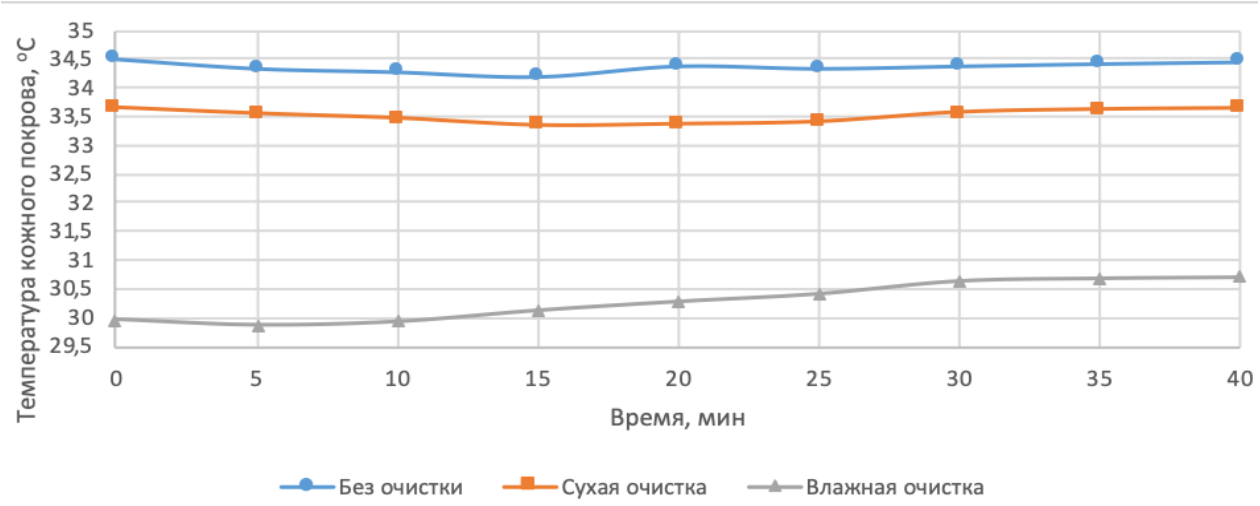

Figure 5 – The dependence of the skin temperature on the cleaning method.
Температура кожного покрова, °С – skin temperature, °С; Время, мин – Time, min;
Без очистки – without cleansing; Сухая чистка – dry cleaning; Влажная чистка – wet cleaning

As a result of wet cleaning, the area of the skin has an average temperature of 11.85% lower than the uncleaned area of the skin, whereas after dry cleaning the difference is 2.51%. In this case, temperature fluctuations of the uncleaned skin areas were not higher than 0.7 °C, and on average changed by 0.3... 0.4 °C. The accuracy of measuring the pyrometer is 1%, which is 0.30... 0.35 °C.

The results are of great importance for beef cattle breeding, increasing the biopotential of productivity [11], early maturity at different periods of ontogenesis [12], in conditions of additional feeding [13] and improving the quality traits of young stock [14].

Conclusions. The obtained data allow us to conclude that an increase in the intensity of heat transfer between the animal and the environment can be achieved by reducing skin contamination. Herewith, wet cleaning is more effective.

According to the research results, it can be argued that wet cleaning of the skin contributes to an enhance in heat transfer from the skin surface both by reducing contamination, which creates an additional heat-insulating layer between the skin surface and the surrounding air, and the evaporation of moisture from the skin surface that occurs after wet cleaning.

The studies and the obtained results allow us to conclude that the development and use of a mechanical device for skin cleaning, which would have wet cleaning functions with detergent, is urgent.

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ЖЫЛ МЕЗГІЛДЕ ЖЫЛУ КҮЙЗЕЛІСІНДЕГІ СИЫРЛАРДЫҢ ТЕРІ ЖАБЫНЫН ТАЗАЛАУДЫҢ МАЛДЫҢ ФИЗИОЛОГИЯЛЫҚ КӨРСЕТКІШТЕРІНЕ ӘСЕРІ

Аннотация. Зерттеудің мақсаты терінің ластануын азайту арқылы жылы мезгілде сиырлардың терісін тазарту әдісінің жануарлар мен қоршаған орта арасындағы жылу алмасу қарқындылығына әсерін бағалау.

Зерттеу әдістемесі теріні тазартудың әртүрлі әдістерімен жануарлардың клиникалық және физиологиялық көрсеткіштерін анықтауға негізделген: терінің температурасы, тыныс алу жиілігі және жануарлардың жүрек соғу жиілігі. Терінің әр аймағының температурасы пирометр көмегімен байланыссыз әдіспен анықталады. Әр учаскенің температурасы 40 минут бойы бақыланады.

К. А. Тимирязев РМАУ – МАА зоостанция сүт фермасында алынған мәлметтер. Зерттеуге бірдей критерийлер бойынша таңдалған 10 жануардан құралған (жасы, салмағы, төлдеу саны, жануарлардың денсаулығы). Зерттеу климаттық камерада 20 ... 30 °С температурада және ауаның салыстырмалы ылғалдылығы 50 ... 80% бірнеше кезеңдерде жүзеге асырылады.

Зерттеудің бірінші кезеңі теріні тазартпай.

Теріні құрғақ тазалаудан кейінгі екінші кезең.

Теріні дымқыл тазартудан кейінгі үшінші кезең.

Әр кезеңде тері температурасы, тыныс алу жиілігі және әр түрлі температурада және салыстырмалы ылғалдылықтағы сиырлардың жүрек соғу жылдамдығы өлшенеді.

Екінші кезеңде өлшеуден бұрын тері щеткамен (қырғышпен) құрғақ тазаланады. Үшінші кезеңде өлшеуден бұрын теріні щеткамен (қырғышпен) және сабын ерітіндісіне негізделген жуғыш затпен ылғалдандырумен іске асырылды.

Терініңбірнешеаймағындатерініңорташатемпературасытуралыдеректержазылады. Теріаймағынтазалағаннанкейін 20 минуттанкейінтерініңтемпературасынөлшеуқұрғақтазалаукезіндеүйкеліс пен ылғалтазартукезіндебуланудыңсалқындатуәсерінболдырмасүшінбасталады. Терітемпературасынөлшеу 40 минут ішінде, 5 минуттықинтервалменжасалады.

Зерттеу нәтижелері көрсеткедей, таңдалған тері аймақтары дайындалады және тазартылады. Климаттық камерадағы жағдайлар қоршаған орта жағдайы үшін температурасы 20,0 °С ға 30,0 °С, ауаның салыстырмалы ылғалдылығы 50,0% ден 80,0 % ізділігі 10 %, ауа ағымының жылдамдығы шамамен - 0,2 м/с, атмосфералық қысым 746 мм. рт. ст., күн сәулесінің тері жамылғысына тікелей түсуі болмады.

Зерттеулер көрсеткендей, құрғақ тазартудан кейін жануарлардағы жүрек қағысының жиілігі тазартылмаған жануарлармен салыстырғанда 4,45%. Ылғал тазартуда айырмашылық 12,95% құрады.

Ылғал тазартудың нәтижесінде тері жамылғысы аймағының орташа температурасы 11,85 %, тазартылмаған аймақтан төмен, құрғақ тазартудан кейін айырмашылық 2,51 % құрады. Тазартуға ұшырамаған тері жамылғысының температурасының ауытқуы, жоғары болмады 0,7 °С, ал орташа өзгеруі 0,3…0,4 °С. Пирометрдің өлшеу айқындығы 1%, 0,30…0,35 °С құрайды.

Алынған нәтижелер сиыр малын өсіруде, өнімділіктің биопотенционалдылығын, онтогенездің әртүрлі кезеңдерінде ерте пісіп жетілуін, қосымша азықтандыру жағдайында және жас малдардың сапалық көрсеткіштерін жоғарылату үшін үлкен маңызға ие.

Алынған мәліметтер терінің ластануын азайту арқылы жануарлар мен қоршаған орта арасындағы жылу беру қарқындылығының артуына қол жеткізуге болады деген қорытынды жасауға мүмкіндік береді. Сонымен қатар, дымқыл тазарту тиімдірек. Зерттеулердің нәтижелері бойынша теріні дымқыл тазарту терінің беткі қабатынан және қоршаған ауа арасындағы қосымша жылу оқшаулағыш қабатын құрайтын және ылғал тазалаудан кейін пайда болатын тері бетінен ылғалдың буланuына байланысты терінің бетінен жылу тасымалының артуына ықпал етеді деп айтуға болады. Зерттеулер мен алынған нәтижелер жуғыш затпен дымқыл тазалауды жүзеге асыра алатын теріні тазартуға арналған механикалық құрылғыны жасау мен қолданудың өзектілігі туралы қорытынды жасауға мүмкіндік береді.

Түйін сөздер: сиырлар, жылу күйзелістері, тері жамылғысы, құрғақ тазарту, ылғалды тазарту.

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ВЛИЯНИЕ ОЧИСТКИ КОЖНОГО ПОКРОВА КОРОВ НА ФИЗИОЛОГИЧЕСКИЕ ПОКАЗАТЕЛИ ПРИ ТЕПЛОВЫХ СТРЕССАХ В ТЕПЛЫЙ ПЕРИОД ВРЕМЕНИ

Аннотация. Целью исследования является оценка влияния способа очистки кожного покрова коров на интенсивность теплообмена животного с окружающей средой в теплый период времени года за счет снижения загрязнения кожного покрова.

Методика исследования основана на определении клинико-физиологических показателей животных при различных способах очистки кожного покрова: температуры кожного покрова, частоты дыхания и частоты сердечных сокращений животных. Температура каждого участка кожного покрова определяется бесконтактным способом с использованием пирометра. Температура каждого участка наблюдается в течение 40 минут.

Данные получены на молочной ферме зоостанции РГАУ-МСХА имени К. А. Тимирязева. В исследовании учувствует группа из 10 животных, выбранных по одинаковым критериям (возраст, масса, количество отелов, состояние здоровья животного). Исследование проводится в климатической камере при значениях температуры 20…30 °С и относительной влажности 50…80 % воздуха в несколько этапов.

Первый этап исследования без очистки кожного покрова.

Второй этап после сухой очистки кожного покрова.

Третий этап после влажной очистки кожного покрова.

На каждом этапе производятся замеры температуры кожного покрова, частоты дыхания и пульса коров при различных значениях температуры и относительной влажности воздуха.

На втором этапе перед замерами кожный покров очищается сухим способом с использованием щетки (скребка). На третьем этапе перед замерами кожный покров очищается влажным способом с использованием щетки (скребка) и моющего средства на основе мыльного раствора.

Регистрируются данные средней температуры кожного покрова по нескольким участкам кожного покрова. После очистки участков кожного покрова, измерения температуры кожного покрова начинаются через 20 минут, чтобы избежать влияния трения при сухой очистки и эффекта охлаждения за счёт испарения при влажной очистке. Замеры температуры кожного покрова производятся в течение 40 минут, с интервалом в 5 минут.

Результаты исследования показали, что выбранные участки кожного покрова подготавливаются и очищаются. Условия в климатической камере составляют для температуры воздуха окружающей среды от 20,0 °С до 30,0 °С с шагом в 5,0 °С , относительной влажности воздуха от 50,0% до 80,0 % с шагом в 10 %, скорость воздушного потока около – 0,2 м/с, атмосферное давление 746 мм. рт. ст., воздействие прямых солнечных лучей на кожный покров отсутствует.

Исследования показали, что частота сердечных сокращений у животных после сухой очистки меньше чем у животных, которые не получили очистку кожного покрова на 4,45%. При влажной очистки разница составляет 12,95%.

В результате влажной очистки участок кожного покрова имеет температуру в среднем на 11,85 % ниже, чем неочищенный участок кожного покрова, тогда как после сухой очистки разница составляет 2,51 %. При этом колебания температуры участков кожного покрова, которые не подвергались очистке, были не выше 0,7°С, а в среднем изменялись на 0,3…0,4°С. Точность измерения пирометра составляет 1%, что составляет 0,30…0,35°С.

Полученные результаты имеют большое значение для мясного скотоводства, повышение биопотенциала продуктивности, скороспелости в различные периоды онтогенеза, в условиях дополнительного скармливания и повышения качественных показателей молодняка.

Полученные данные позволяют сделать вывод, что повышение интенсивности теплообмена животного с окружающей средой можно добиться за счет снижения загрязнения кожного покрова. При этом влажная очистка более эффективна. По результатам исследований можно утверждать, что влажная очистка кожного покрова способствует увеличению теплоотдачи с поверхности кожи как за счет уменьшения загрязнения, которое создает дополнительный теплоизоляционный слой между поверхностью кожи и окружающим воздухом, так и за счет испарения влаги с поверхности кожи, возникающего после влажной очистки. Проведенные исследования и полученные результаты позволяют также сделать вывод об актуальности разработки и применения механического устройства очистки кожного покрова, обладающего возможностью проводить влажную очистку с моющим средством.

Ключевые слова: коровы, тепловые стрессы, кожный покров, сухая очистка, влажная очистка.

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MEAT PRODUCTIVITY OF BULL CALVES OF DIFFERENT DIRECTIONS OF PRODUCTIVITY USING FEEDING COMBINED WITH FINAL FATTENING

Abstract. A scale-up in beef production from the livestock of different origins can be realized only with the use of intensive production technologies, in which the main goal should be the maximum implementation of productivity with the lowest cost of labor and facilities. In some regions characterized by the presence of large pasture areas, it is important to maintain feeding during the pasture period, when beef production occurs without serious material and labor investments. The purpose of the research was a comparative assessment of the meat productivity of the Red steppe, Brown Swiss and Aberdeen-Angus bull calves when feeding in combination with final fattening in the conditions of Hammer agricultural company of the Karachay-Cherkess Republic. For the experiment, three groups of 8-month-old bull calves were formed with 15 animals each: Red steppe (I group), Brown Swiss (II group) and Aberdeen Angus (III group). The experimental groups of calves were reared for 160 days, feeding - for 142 days and final fattening - for 60 days. At the end of the rearing, 3 animals from each group, after feeding - 5 animals each and after the final fattening - 7 animals each were slaughtered. In all production cycles, bull calves of the Aberdeen-Angus breed differed in maximum values of average daily gain in live weight, which ensured them over the entire experiment period the dominancy over peers of Brown Swiss breed by 53 g (P>0.999), of Red steppe - by 91 g (P>0.999) at the lowest cost of feed per 1 kg of live weight gain (an average of 0.32-0.64 energy feed units and 0.03-0.06 kg of digestible protein). Comparison of the slaughter qualities of young stock of different origin in different production cycles indicates a significant superiority of the Aberdeen-Angus bull calves, although significant differences in slaughter yield occurred only after the final fattening (by 1.5-2.8%, P>0.95- 0.999). The obtained values for flesh and bones content in the carcass of experimental young animals provided the best ratio among bulls of the Aberdeen-Angus breed, whose coefficient full meatiness was higher by 0.18-0.33 units by the end of the growing period, and by 0.24-0.43 units after the feeding, and after final fattening - by 0.18-0.34 units. (concerning the bull-calves of the Red steppe breed P>0.95).

Key words: breed, Aberdeen-Angus, Red steppe, Brown Swiss, growth, meat productivity, feed-conversion efficiency, slaughter qualities, the morphological composition of carcasses.

Introduction. In the production of livestock products, the choice of a particular technology should be accompanied not only by ensuring high productivity indicators, but also by the highest return of investment in the industry [1]. The increase in cattle meat productivity in the vast majority of beef cattle breeding regions is achieved by keeping animals on pasture. However, the dominant part of our country's natural pastures needs a radical and (or) surface improvement. [2].

An increase in the volume of produced beef can be achieved by increasing labor productivity and reducing the cost of feed per unit of live weight gain, which is only possible using intensive technologies of growing and fattening young cattle in different directions of productivity [3]. As usual, large agricultural holdings specialize in such approaches [4,5], while the prevailing part of agricultural

enterprises due to imperfect production and economic relations is characterized by unprofitability in beef production.

Unfortunately, despite the measures taken to stabilize and further increase this type of raw meat, the situation for beef production remains difficult, and therefore it is necessary to use all available resources - the use of the gene pool of meat, dairy and combined breeds in the rearing and feeding of purebred and cross-bred young animals using intensive technologies of growing and fattening, application of supplementary feeding, etc. [6,7,8].

In this direction, there is a whole series of publications by scholars and practical workers specializing in beef production. When assessing the formation of meat productivity, the main indicators are carcass weight, morphological composition, and slaughter yield. These traits are driven by a complex of morphological characteristics of the organism, which depend on heredity and environmental factors [9,10].

In the studies of D.A. Baimukanov, V.N. Pristupa, Yu.A. Kolosov, et al., it was found that the higher the live weight of cows, the better the growth rate is manifested in their offspring. With the intensive level of feeding on heavy cows, the offspring is 10-20 kg heavier than peers obtained from lightweight cows and, when grown further, the former show a higher rate of live weight gain and form an enlarged body type. Among such animals, individuals that meet the requirements of the standard of the enlarged type are more common, and with individual homogeneous selection, they give highly productive offspring. [9].

In the opinion of V.N. Lukyanov, I.P. Prokhorov [10], the intensive rearing and fattening of Simmental bulls and Hereford crosses up to 15 months of age, and Charolais crossbreeds up to 18 months of age provided heavy carcasses with the required meat quality, relatively low cost of 1 kg of gain and significant net income when selling them for meat. The most profitable was the intensive rearing and fattening of Charolais crossbreed since they inherited from the father breed the ability to prolong and intensive growth without excessive fat deposition and better feed-conversion efficiency by gaining.

Depending on the fatness of the calves when they enter the pastures for five to six months of the grazing season, they can increase live weight by 120-140 kg [11]. Moreover, young Aberdeen-Angus calves respond well to immunostimulation with biological products of a new generation of domestic (Russian) production, due to this, adaptogenesis and quality of produced beef are increased [12,13].

When using a pasture conveyor from annual forage crops and conducting ration grazing during the drying-out period of the grass stand, it is possible to significantly reduce the time to achieve the required live weight with relatively low labor and material costs.

The experience of foreign countries shows that the technology of beef production, which consists of two cycles (the 1st cycle - the operation “cow-calf”, the 2nd cycle - the growing and fattening of calves after weaning from 6-8 to 18 months of age) has its features - the maximum duration of use and maintenance of cows with offspring and replacements, the use of seasonal tour calving, the maintenance of adult cattle in winter in lightweight premises, the intensive rearing and fattening of young stock in specialized feeding yards [14].

In agricultural enterprises specializing in breeding beef cattle, it is recommended that growing and fattening should be carried out with the division of the production cycle into three periods in a single production cycle and, depending on the feeding capacity (specific weight of concentrates in diets), to establish the age of young animals to be sold at 14–18-months of age upon reaching the live weight of 420-440 kg [15]. The specified technology ensures good use of feed and obtaining full-fledged carcasses with high technical and economic indicators of production.

The aim of the research was to give a comparative assessment of the meat productivity of the Red steppe, Brown Swiss and Aberdeen-Angus breed calves when feeding in combination with final fattening in the conditions of Hammer agricultural company of the Karachay-Cherkess Republic.

Object, material and research methods. For the experiment, three groups of 8-month-old bull calves were formed with 15 animals each: Red steppe (I group), Brown Swiss (II group) and Aberdeen Angus (III group). The live weight of the bulls of the Red steppe breed when setting them up for growing amounted to an average of 175 kg, of Brown Swiss - 177 kg, and Aberdeen-Angus - 183 kg.

The experimental groups of calves were reared for 160 days, the feeding was conducted for 142 days and final fattening for 60 days. The total duration of the experiment was 362 days. At the end of the

growing, 3 animals from each group, after feeding - 5 animals each and after the final fattening - 7 animals each were slaughtered.

The feeding of the experimental livestock on high mountain pastures was carried out from the first decade of May till October 1, 2019.

Weighing of animals was performed in the following technological periods: when setting up for rearing, before being sent to pasture (at the end of rearing), after feeding and final feeding.

During the research period, an average of 28 centners of energy feed units and 2.4 centners of digestible protein were used for each animal. During the feeding season, the consumption of pasture grass was determined by the method of recounting taking into consideration the average daily gain in live weight.

The absolute, average daily and relative gains in live weight were calculated according to the formulas common in zootechnics.

As a result of control slaughter, pre-slaughter live weight, carcass and fat mass and yield, and slaughter yield have been studied. Evaluation of these indicators was carried out according to the methods of the Federal Science Center for Animal Husbandry and Federal Science Center for Nutrition System at a meat processing plant in Cherkessk.

The morphological composition of the carcasses of bull calves was analyzed by the mass of pulp, bones, cartilage, and cords. The full meatiness coefficient was calculated by the ratio of the meat part to the bone mass.

Digital research material has been processed using BIOMETR.EXE software. From statistical indicators, the arithmetic mean and the arithmetic mean error were taken into account. The reliability of intergroup differences in the studied indicators was estimated by the Student table at three levels of probability (P>0.95; P>0.99 and P>0.999).

Research results and discussion. Values of the live weight of the experimental groups of bulls in separate technological periods of growing, feeding, and fattening are shown in table 1.

Table 1 – Change in live weight of bull calves of different breeds during the production cycle

Breed	Production cycle			
	Before growing	After growing	By the end of a feeding	After the final fattening
Red steppe	175.0±1.14**	290.0±1.67***	403.6±1.83***	464.8±3.02***
Brown Swiss	177.3±1.36*	296.7±1.52***	414.0±1.81***	481.4±2.83***
Aberdeen-Angus	183.2±1.98	310.8±2.70	433.6±3.65	506.2±4.81

When forming groups of bull calves, no significant differences in live weight were found between individuals of the Red steppe and Brown Swiss breeds, although the representatives of both breeds were inferior to the Aberdeen Angus calves by an average of 5.9-8.2 kg (P>0.95-0.99). As a result of 160 days of rearing, the live weight of bull calves of the Red steppe breed increased by 115 kg, Brown Swiss breed - by 119.4 kg and Aberdeen-Angus breed - by 127.6 kg, by the end of growing this ensured the superiority of meat breeds over peers of other breeds in an average of 14.1-20.8 kg (P>0.999). The feeding provided the animals a weight of 400 kg or more and, as expected, the bulls of the Aberdeen-Angus breed were characterized by the highest values - 433.6 kg, with the smallest values - the peers of the Red steppe breed - 403.6 kg, while the individuals of the combined direction of productivity were defined by intermediate values. During the final fattening, the representatives of the Aberdeen Angus and Brown Swiss breeds were more sensitive to the improved feeding conditions, which outperformed the Red steppe peers by an average of 41.4 and 16.6 kg, respectively (P>0.999 and P>0.99).

The values of the absolute gain in live weight in all groups of calves during the growing and feeding periods were almost at the same level with some superiority obtained during the period of grazing animals (table 2).

Table 2 – Absolute and average daily gain in live weight
of bull calves during periods of growing, feeding and final fattening, $X \pm m_x$

Breed	Продолжительность производственного цикла (сут.)			
	Growing (160 days)	Feeding (142 days)	Final fattening (60 days)	For the whole production cycle (362 days)
The absolute gain in live weight, kg				
Red steppe	115.0±0.50***	113.6±1.25***	59.5±1.65***	289.2±2.29***
Brown Swiss	119.4±0.97***	117.3±1.17***	67.5±0.59*	303.2±1.41***
Aberdeen-Angus	127.6±1.74	124.3±1.05	71.4±1.25	322.2±2.66
An average daily gain in live weight, g				
Red steppe	719±3.15***	798±8.63***	992±27.60***	799±7.81***
Brown Swiss	746±6.09***	823±8.22***	1126±9.88*	837±3.85***
Aberdeen-Angus	797±10.91	875±7.36	1191±20.90	890±7.38

It should be noted that the absolute gain in live weight of bull calves during the feeding period was higher than during rearing since the duration of the pasture period is 18 days shorter. This trend was confirmed by the values of the average daily live weight gain obtained in the compared technological periods. Regardless of the production cycle — growing and feeding — the highest values of the average daily gain in live weight were for the young stock of the Aberdeen-Angus breed, whose superiority over animals of other groups varied between 51-78g (P> 0.999) and 52-77g (P> 0.999), respectively. During the final fattening, the superiority of Aberdeen-Angus calves over other breeds increased compared to previous periods and reached 65-199 g (P>0.95-0.999). Throughout the experiment, the superiority in an average daily gain in live weight of bull calves of the Aberdeen-Angus breed over the peers of the Brown Swiss breed was 53 g (P>0.999), of the Red steppe - 91 g (P>0.999).

The highest relative growth rate in all technological periods of the experiment was demonstrated by the bulls of the Aberdeen-Angus breed, it provided them with an advantage in this indicator over the entire period of research. Regardless of the breed, the maximum growth energy was manifested during the growing period, which decreased slightly in feeding and reached minimum values in the final feeding, which is consistent with the specific pattern consisting of a gradual decrease in the relative growth rate with age.

During the experiment, lasting 362 days, the experimental groups of calves consumed different amounts of nutrients, they received unequal absolute growths, which contributed to differences in feed-conversion efficiency by a gain in live weight (table 3).

Table 3 – Feed-conversion efficiency by the gain in live weight
of bull calves during the experiment (on average per animal)

Indicator	Breed		
	Red steppe	Brown Swiss	Aberdeen-Angus
The absolute gain in live weight, kg	289.2	303.2	322.2
Consumed: EFU, kg Digestible protein, kg	2712 236	2748 241	2816 245
Expended per unit of gain in live weight: EFU, kg Digestible protein, kg	9.38 0.82	9.06 0.79	8.74 0.76

As a result of the highest feed consumption, the maximum gains were obtained from the Aberdeen-Angus bulls, while peers of the Red steppe breed were characterized by the lowest feed consumption with minimal absolute gain in live weight among the analyzed groups of animals. According to the specified indicators, the young animals of the Brown Swiss breed occupied an intermediate position between the extreme values of traits. These trends provided the superiority to meat bull calves, in which the cost per 1 kg of live weight gain was 0.32-0.64 energy feed units and 0.03-0.06 kg of digestible protein lower than in peers of other breeds.

During the analyzed age periods of slaughter, young Aberdeen-Angus calves differed in maximum pre-slaughter live weight, which in this indicator, after growing, exceeded peers of other groups by

13.6-19.8 kg, after feeding - by 18.8-28.6 kg (P>0.95-0.99) and after the final fattening - by 24.0-39.7 kg (P>0.999). At the end of all production cycles, large carcass weight was for animals of the Aberdeen-Angus breed: after growing by 11.5-16.9 kg, after feeding by 15.4-25.7 kg (P>0.95-0.99) and after the final fattening - by 21.1-36.6 kg (P>0.99-0.999). The age-related increase in the differences in carcass weight between the experimental groups of bull calves is quite natural (table 4).

It should be pointed out that the greatest localization of internal fat was noted in carcasses obtained from the Red steppe bull calves, the smallest one - in the Aberdeen-Angus breed. These differences between the compared groups of bull calves at the end of the growing reached 1.1 kg, after the feeding - 1.0 kg and after fattening - 0.5 kg, although they are not reliable. With age, regardless of the origin of the calves, as expected, the mass of internal fat increases.

As a result, the slaughter yield of the Aberdeen-Angus bulls in all production cycles was higher than in young animals of the combined and dairy directions of productivity. The differences in this indicator between the compared groups of calves were 1.3 and 2.1% at the end of growing, respectively, after the feeding - 1.1 and 2.2% (P>0.95), after the fattening - 1.5 (P>0, 95) and 2.8% (P>0.999). Along with interbreeding differences, a regular age-related increase in slaughter yield was observed in all groups of bulls. So, during the slaughter of bulls after feeding in comparison with that after growing, the values of the analyzed indicator increased, depending on the breed, by 1.3-1.6 abs. percent, and after the final fattening - by 3.9-4.6 abs. percent, and by a large amount in individuals of the Brown Swiss and Aberdeen-Angus breeds.

Table 4 – the results of the control slaughter of the experimental groups of calves, $X \pm m_x$

Indicator	Breed		
	Red steppe	Brown Swiss	Aberdeen-Angus
After growing (n=3)			
Pre-slaughter live weight, kg	286.2±4.84	292.4±2.68	306.0±9.56
carcass weight, kg	143.7±4.84	149.1±4.32	160.6±5.46
Carcass yield, %	50.2±0.90	51.0±1.04	52.5±0.41
Fat mass, kg	6.3±0.32	5.5±0.46	5.2±0.57
Fat yield, %	2.2±0.08	1.9±0.14	1.7±0.14
Weight of carcass and fat, kg	150.0±5.16	154.6±4.75	165.8±6.04
Slaughter yield, %	52.1±0.63	52.9±1.17	54.2±0.50
After feeding (n=5)			
Pre-slaughter live weight, kg	398.0±2.64**	407.8±3.47*	426.6±6.70
carcass weight, kg	203.0±2.83**	213.3±3.24*	228.7±5.06
Carcass yield, %	51.0±0.63	52.3±0.39	53.6±0.37
Fat mass, kg	9.5±0.44	9.0±0.53	8.5±0.33
Fat yield, %	2.4±0.11	2.2±0.11	2.0±0.04
Weight of carcass and fat, kg	212.5±3.16**	222.3±3.70	237.2±5.39
Slaughter yield, %	53.4±0.66*	54.5±0.49	55.6±0.41
After fattening (n=7)			
Pre-slaughter live weight, kg	456.1±2.76***	471.8±2.66***	495.8±4.63
carcass weight, kg	243.5±2.69***	259.0±3.20**	280.1±3.76
Carcass yield, %	53.4±0.32	54.9±0.39	56.5±0.30
Fat mass, kg	11.9±0.36	11.3±0.35	11.4±0.30
Fat yield, %	2.6±0.06	2.4±0.05	2.3±0.04
Weight of carcass and fat, kg	255.4±3.05***	270.3±3.55**	291.5±4.06
Slaughter yield, %	56.0±0.37***	57.3±0.43*	58.8±0.34

The morphological composition of carcasses of different breeds turned out to be different both in connection with the origin and in different production cycles of beef production (table 5).

Table 5 – The morphological composition of carcasses of bull calves of different breeds after growing, feeding and fattening, $X \pm m_x$

Indicator	Breed		
	Red steppe	Brown Swiss	Aberdeen-Angus
After growing			
weight of chilled carcass, kg	143.7±4.84	149.1±4.32	160.6±5.46
pulp mass, kg %	110.6±4.5 77.0±0.6	115.4±4.4 77.4±2.1	125.7±6.3 78.2±1.99
bones mass, kg %	29.6±0.14 20.6±0.60	30.0±2.4 20.1±1.60	31.0±2.6 19.3±0.99
mass of cords and cartilage, kg %	3.5±0.2 2.4±0.04	3.7±1.3 2.5±0.79	3.9±0.5 2.4±0.25
coefficient of full meatiness, units	3.74±0.13	3.89±0.43	4.07±0.14
After feeding			
weight of chilled carcass, kg	203.0±2.83**	213.3±3.25*	228.7±5.06
pulp mass, kg %	157.5±1.72*** 77.6±0.50	167.6±2.14** 78.6±0.30	181.6±2.40 79.4±0.70
bones mass, kg %	40.0±2.07 19.6±0.75	40.5±2.10 19.0±0.75	41.6±2.40 18.2±0.67
mass of cords and cartilage, kg %	5.5±1.04 2.7±0.53	5.2±1.00 2.4±0.49	5.5±0.44 2.4±0.16
coefficient of full meatiness, units	3.97±0.18	4.16±0.18	4.40±0.20
After fattening			
weight of chilled carcass, kg	243.5±2.69***	259.0±3.20**	280.1±3.76
pulp mass, kg %	190.2±2.90*** 78.1±0.38	203.8±2.72*** 78.7±0.27	222.7±3.16 79.5±0.31
bones mass, kg %	46.7±0.51** 19.2±0.40	47.9±0.87 18.5±0.32	50.4±1.00 18.0±0.33
mass of cords and cartilage, kg %	6.6±0.27 2.7±0.09	7.3±0.29 2.8±0.08	7.0±0.32 2.5±0.08
coefficient of full meatiness, units	4.08±0.10*	4.24±0.09	4.42±0.10

The highest pulp content was in the Aberdeen-Angus bulls: at the end of growing 10.3-15.1 kg, feeding - 14.0-24.1 kg (P>0.99-0.999) and final fattening - 18 9-32.5 kg (P>0.999).

No significant interbreed differences were registered in the bones mass as well as in cartilage and tendons, only after fattening the Aberdeen Angus significantly exceeded the calves of the Red steppe breed in bone content (by 3.7 kg, P>0.99). The relative yield of these parts of the carcass was lower in meat calves, and the maximum - in peers of dairy and combined directions of productivity.

The obtained values for the content of pulp and bones in the carcass of experimental young animals provided the best ratio among bulls of the Aberdeen-Angus breed, the coefficient of the full meatiness of which was higher in all production cycles than in individuals of other breeds. So, by the end of the growing period, these differences were 0.18-0.33 units, after the feeding - 0.24-0.43 units, and after the final fattening - 0.18-0.34 units. (in relation to the bull-calves of the Red steppe breed P>0.95). With age, the level of the coefficient of full meatiness for all groups of calves increased and reached the maximum for slaughter after the final fattening.

Conclusion. As a result of the young stock formation of the Red steppe, Brown Swiss and Aberdeen-Angus breeds at the age of 8 months with the aim of further rearing, feeding and final fattening, the livestock with high slaughter qualities was obtained. The greatest impact from different production cycles was received as a result of the slaughter of young animals after the final fattening. Other conditions being equal, the biggest pulp yield and the best coefficients of the full meatiness of carcasses were shown by the bulls of the Aberdeen-Angus breed, especially after a two-month final fattening. The smallest expenditure of nutrients per unit of gain in live weight during the experiment is characterized by young meat production trends. Obvious is the fact of the essence of all production cycles - growing, feeding and fattening, after which the young stock reaches a mass of 450-500 kg.

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ҚОРЫТЫНДЫ БОРДАҚЫЛАУ МЕН ЖАЙЫЛЫММЕН ҮЙЛЕСКЕН ТҮРЛІ БАҒЫТТАҒЫ БҰҚАЛАРДЫҢ ЕТ ӨНІМДІЛІГІ

Аннотация. *Зерттеу мақсаты* – қырдың қызыл, қоңыр швиц және абердин – ангусс тұқымдары бұқаларының ет өнімділігіне салыстырмалы бағалау беру. Қорытынды бордақылау Карачай-Черкес Республикасының «Хаммер» агрофирмасы жағдайында өткізілді.

Жас бұқалардың топтарын қалыптастыруда тірі салмағы бойынша қырдың қызыл және қоңыр швиц тұқымының арасында айтарлықтай айырмашылық болған жоқ, алайда қос топта абердин – ангус тұқымына орташа алғанда 5,9-8,2 кг орын берді (P>0,95-0,99). 160 тәуліктік өсім нәтижесінде қырдың қызыл тұқымы – 115 кг, қоңыр швиц – 119,4 кг және абердин – ангус – 127,6 кг еселенді, өсімнің соңында екі құрдастарынан да орташа есеппен алғанда 14,1-20,8 кг (P>0,999) басым болды. Жайылым жануарлардың 400 кг және одан да жоғары салмақ қосуын қамтамасыз етті, жоғары салмаққа абердин – ангус тұқымы – 433,6 кг ие болды, төменге қырдың қызыл тұқымы - 403,6 кг иеленді. Қорытынды бордақылау нәтижесінде абердин – ангус және қоңыр швиц тұқымдары басымдыққа ие болды, тірі массасы бойынша 41,4 және16,6 кг сәйкесінше (P>0,999 және P>0,99).

Барлық топ бұқаларында тірі массаның абсолютті өсім мәні өсіру және жайылым барысында бір деңгейде болды. Атап өтетін жағдай тірі масса бойынша абсолютті өсім жайылым кезеңінде басым болды. Екі кезеңдеде орташа тәуліктік өсім бойынша абердин – ангус тұқымдары басымдыққа ие болды 51-78 (P>0,999) және 52-77 (P>0,999). Қорытынды бордақылау кезінде абердин – ангус тұқымының басқа тұқымдардан басымдылығы ұлғайды және 65-199 г (P>0,95-0,999) жетті. Қоңыр швиц тұқымынан орташа өсім бойынша 53 г (P>0,999) және қырдың қызыл 91 г (P>0,999) басымдылыққа ие болды.

Тәжірбие барысында, 362 тәулік ұзақтығында жас бұқалар тобында түрлі мөлшерде азықтар қолданылды. Олардан түрлі өсім алынды. Максималды азық қолдану нәтижесінде жоғары өсімге абердин – ангус тұқымы ие болды. Қызыл қыр тұқымы аз өсім берді. Қоңыр швиц тұқымы аталған көрсеткіште аралық мәнге ие болды. Көрсетілген тенденциялар етті бағыттағы жас бұқалардың артықшылығын айқындады, тірі салмақтың 1 кг өсіміне 0,32-0,64 энергетикалық азықтық бірлік және 0,03-0,06 кг қорытылатын протеин шығымы басқа тұқымдармен қарағанда төмен.

Бір жасқа дейінгі бұқалардың ұшаларының морфологиялық құрамы шығу тегіне байланысты түрлі болды. Таза ет шығымының көп мөлшері абердин – ангус тұқымына тән болды: жетілдіру соңында - 10,3-15,1 кг, жайылымда - 14,0-24,1 кг (P>0,99-0,999) және қорытынды бордақылауда - 18,9-32,5 кг (P>0,999). Сүйектер сонымен қатар шеміршек пен сіңір массасы бойынша айтарлықтай тұқымаралық айырмашылықтар байқалған жоқ, тек бордақылаудан кейін абердин – ангус тұқымдары қызыл қыр тұқымынан сүйектер мөлшері бойынша басым болды (3,7 кг, P>0,99).

Бұлшықеттің және сүйектердің мөлшері бойынша алынған мәлметтер тәжірбиелік жануарларда абердин – ангус тұқымы қалған екі тұқымнан басым болды. Осылайша, жетілдіруде бұл айырмашылықтар 0,18-0,33 бірлік, жайылымда - 0,24-0,43бірлік және қорытынды бордақылау - 0,18-0,34 бірлік (қырдың қызыл тұқымына байланысты P>0,95). Қорытынды бордақылаудан кейін жас қосқан сайын еттілік коэффициенті ұлғайды және максимальды көрсеткішке жетті.

Түйін сөздер: тұқым, абердин – ангус, қыр қызылы, қоңыр щвиц, өсу, ет өнімділігі, азық төлемі, сойыс сапасы, еттің морфологиялық құрамы.

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МЯСНАЯ ПРОДУКТИВНОСТЬ БЫЧКОВ РАЗНОГО НАПРАВЛЕНИЯ ПРОДУКТИВНОСТИ ПРИ НАГУЛЕ В СОЧЕТАНИИ С ЗАКЛЮЧИТЕЛЬНЫМ ОТКОРМОМ

Аннотация. *Цель исследований* – дать сравнительную оценку мясной продуктивности бычков красной степной, бурой швицкой и абердин-ангусской пород при нагуле в сочетании с заключительным откормом в условиях агрофирмы «Хаммер» Карачаево-Черкесской Республики.

При формировании групп бычков не обнаружено достоверных различий по живой массе между особями красной степной и бурой швицкой пород, хотя представители обеих пород уступали абердин-ангусам в среднем на 5,9-8,2 кг (P>0,95-0,99). В результате 160-суточного доращивания живая масса бычков красной степной породы увеличилась на 115 кг, бурой швицкой – на 119,4 кг и абердин-ангусской – на 127,6 кг, что обеспечило к концу доращивания превосходство особям мясной породы над сверстниками других пород в среднем на 14,1-20,8 кг (P>0,999). Проведенный нагул обеспечил достижение животными массы 400 кг и более, причем, как и ожидалось, наибольшими значениями характеризовались бычки абердин-ангусской породы – 433,6 кг, наименьшими – сверстники красной степной породы – 403,6 кг, тогда как особи комбинированного направления продуктивности характеризовались промежуточными значениями. В период заключительного откорма отзывчивее на улучшенные условия кормления оказались представители абердин-ангусской и бурой швицкой пород, которые превзошли по живой массе сверстников красной степной породы в среднем на 41,4 и 16,6 кг соответственно (P>0,999 и P>0,99).

Значения абсолютных приростов живой массы у всех групп бычков в периоды доращивания и нагула были, практически, на одном уровне с некоторым превосходством, полученным в период пастбищного содержания животных. При этом следует отметить, что абсолютные приросты живой массы бычков в период нагула оказались выше, чем при доращивании, так как продолжительность пастбищного периода на 18 суток короче. Эту тенденцию подтвердили значения среднесуточных приростов живой массы, полученные в сравниваемые технологические периоды. Независимо от производственного цикла – доращивание и нагул – наибольшими значениями среднесуточного прироста живой массы характеризовался молодняк абердин-ангусской породы, чье превосходство над животными других групп варьировало в пределах 51-78 (P>0,999) и 52-77 (P>0,999) г соответственно. В период заключительного откорма превосходство абердин-ангусов над бычками других пород увеличилось относительно предыдущих периодов и достигло 65-199 г (P>0,95-0,999). За весь период опыта превосходство по среднесуточному приросту живой массы бычков абердин-ангусской породы над особями бурой швицкой породы составило 53 г (P>0,999), красной степной – 91 г (P>0,999).

За период опыта, продолжительностью 362 суток, подопытные группы бычков потребили разное количество питательных веществ, от них получены неодинаковые абсолютные приросты, что способствовало различиям в оплате корма приростом живой массы. В результате наибольшего потребления кормов максимальные приросты были получены от бычков абердин-ангусской породы, тогда как сверстники красной степной породы характеризовались наименьшим расходом кормов при минимальном абсолютном приросте живой массы среди анализируемых групп животных. Молодняк бурой швицкой породы по указанным показателям занимал промежуточное положение между крайними значениями признаков. Указанные тенденции обеспечили превосходство бычкам мясной породы, у которых затраты на 1 кг прироста живой массы оказались на 0,32-0,64 энергетических кормовых единиц и 0,03-0,06 кг переваримого протеина ниже, нежели у особей других пород.

Морфологический состав туш бычков разных пород оказался различным как в связи с происхождением, так и в разные производственные циклы производства говядины. Наибольшее содержание мякоти было свойственно бычкам абердин-ангусской породы: по окончании доращивания на 10,3-15,1 кг, нагула – на 14,0-24,1 кг (P>0,99-0,999) и заключительного откорма – на 18,9-32,5 кг (P>0,999). По массе костей, а также хрящей и сухожилий существенных межпородных различий не обнаружено, лишь после откорма абердин-ангусы достоверно превзошли бычков красной степной породы по содержанию костей (на 3,7 кг, P>0,99). Относительный выход этих частей туши был ниже у бычков мясной породы, а максимальный – у сверстников молочного и комбинированного направлений продуктивности.

Полученные значения по содержанию мякоти и костей в туше подопытного молодняка обеспечили наилучшее их соотношение у бычков абердин-ангусской породы, коэффициент полномясности которых во все производственные циклы был выше, нежели у особей других пород. Так, к концу периода доращивания эти различия составили 0,18-0,33 ед., нагула – 0,24-0,43 ед. и заключительного откорма – 0,18-0,34 ед. (по отношению к бычкам красной степной породы P>0,95). С возрастом уровень коэффициента полномясности у всех групп бычков увеличивался и достигал максимальных значений к убою после заключительного откорма.

Ключевые слова: порода, абердин-ангусская, красная степная, бурая швицкая, рост, мясная продуктивность, оплата корма, убойные качества, морфологический состав туш.

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REPRODUCTIVE QUALITIES OF COWS WITH THE APPLICATION OF BIOLOGICAL PREPARATIONS

Abstract. The pharmaceutical market offers a wide range of various products, many of which are of chemical origin, the bioavailability of which is low. Besides, previously proposed drugs impact only on certain factors of non-specific resistance, which does not fully ensure the activation of the body's immune system. With secondary immunodeficiencies, potentially pathogenic and pathogenic microorganisms play a significant role in the development of the disease, therefore, antibacterial preparations that can have an immunosuppressive effect are used in the treatment of animals. It is most advisable to prescribe to animals immunostimulants made from natural raw materials with antibacterial drugs. In the combined use, a double hit is applied to the pathogen: the antibacterial drug inhibits the functional activity of the pathogen, increasing its sensitivity to phagocytosis, and the immunostimulant activates the phagocyte, increasing its ability to neutralize the pathogen.

A production method for the prevention of postpartum diseases and the realization of the bioresource potential of the reproductive qualities of black-and-white cattle by enhancing the nonspecific resistance of the organism of pregnant cows with a biological product of the Prevention series is proposed. The analysis of the leukocyte blood profile of pregnant and newly-calved cows is carried out. It was established that the use of biological products in critical periods of pregnancy of cows in the 1st and 2nd experimental groups reduced the occurrence of obstetric and gynecological diseases in the postpartum period, and also increased the reproductive qualities of cows. Moreover, the most pronounced corresponding effect was obtained in the 2nd experimental group, where the Prevention series drug was used. The production method for activating cellular factors of nonspecific protection and stress resistance of the organism of black-and-white cattle through the use of a biological product of the Prevention series is proposed. Against the background of intramuscular administration of biological products in the 1st and 2nd experimental groups, physiological leukocytosis, moderate neutropenia with a shift of the nucleus to the right, lymphocytosis and eosinophilia were established, with a more pronounced respective effect of the Prevention series preparation.

Key words: cows, pregnancy, biological preparations, nonspecific resistance, hematological profile.

Introduction. In maintaining the optimal level of dairy cattle husbandry, the correct organization of the herd reproduction is essential. There is a set of organizational and veterinary measures, including young stock breeding, keeping and operating of cows in compliance with hygienic norms and regulations, making balanced feeding diets, introducing young animals into the herd, organizing artificial insemination, skilled veterinarian work, etc. [1,2].

Reproductive qualities and productivity of cows are the main links in cattle breeding. However, these qualities are not realized enough in cows, and cattle breeding is faced with the task of improving them. According to several researchers, generally, in the country, the calf yield from 100 cows is in the range from 70 to 80 animals, and the service period reaches 100-140 days. A significant effect on the number of

produced offspring is caused by abortions and stillbirths - 2-7%. The duration of the operation of cows reaches 3-4 lactations. The causes of these problems can be poor feeding of animals depending on their physiological state in terms of nutrients, vitamins and minerals, poor-quality veterinary services and violation of hygienic conditions of maintenance, illiterate operation of animals, faults in organizing artificial insemination and the technology for growing the herd, and many others [3,4,5].

The main way to increase dairy production is to increase the number of cows and enhance their productivity. To systematically provide the market with animal products, there is a need to intensify herd reproduction, for this it is necessary to solve the problem of infertility, to improve the breeding stock reproduction and increase the safety of calves. The reproductive function of cows is directly dependent on the course of childbirth and the postpartum period, which is emphasized in the works of recent years by many scientists [6].

High productive qualities of cows are one of the main reasons for the occurrence of dryness. In turn, infertility hurts the profitability of animal husbandry: cows have reduced milk yields, lack of calves, and therefore, these animals have to be culled even at a young age, since treatment, maintenance and repeated unsuccessful insemination bring only production losses. Difficulties arise in increasing the livestock of highly productive livestock since such livestock is more prone to metabolic disturbances and a decrease in reproductive qualities. In the fight against this problem, special prophylactic and therapeutic methods should be used, certain veterinary-hygienic conditions of maintenance and operation, as well as animal feeding standards, must be observed. [7,8].

Nonspecific resistance is important in maintaining animal health. It is the first actual barrier when a pathogenic agent enters the body, and it is the state of this factor that determines the health and well-being of the herd. Adverse effects on the animal organism are reflected in the hematological profile, the indicators of which show the state of nonspecific resistance of the organism. Blood examinations allow analyzing the subtle mechanisms of regulation of physiological processes in the animal's body [9].

At the present stage of the cattle breeding development, the problem of preventing adverse effects on the body by factors causing a decrease in the reproductive and productive qualities of animals is of particular importance. One of the ways to prevent the negative impact of stress factors is the immunostimulation of the body with biological preparations [2].

The aim of this work is to investigate the reproductive qualities of cows on the background of activation of nonspecific protective factors of the body with new generation biological preparations.

Material and methods. The methodology of the work comprises the use of a biological product of the Prevention series in the group of down-calving and newly-calved cows to prevent the occurrence of postpartum complications and improve their reproductive qualities. The scientific and economic experiment was carried out based on the dairy farm of Smak-Agro LLP, Mariinsko-Posadsky district of the Chuvash Republic. The material obtained during the scientific experiment was processed under the conditions of the Chuvash State Veterinary Laboratory, of the State Veterinary Service of the Chuvash Republic and in the laboratory of clinical and hematological studies of the Chuvash State Agricultural Academy. In the scientific and economic experiment, three groups of cows of the dry period of 10 animals each were formed, observing the principle of analogs and taking into account the physiological state, productivity and live weight.

The conditions for keeping and feeding cows of all groups were the same.

To activate the nonspecific resistance of the organism in pregnant cows, to prevent diseases of the postpartum period and to realize the bioresource potential of the reproductive qualities of black-and-white cattle, a new generation biological preparation was used, developed by scientists of the Chuvash State Agricultural Academy (V.G. Semenov et al.). In the 1st experimental group, 60 days before the expected calving, the cows were injected intramuscularly with ASD-F2 with eleovitis in a ratio of 1: 9, in the 2nd experimental group, the developed preparation was used at a dose of 10 ml three times with an interval of 10 days in the last decades of pregnancy, and in the control, these preparations were not injected into animals.

Results. The main indicators of the air basin, both in the cowshed and in the maternity ward, were within the zoohygienic standards: T, °C - 9.9±0.24 and 14.9±0.41; R,% - 71.3±1.11 and 70.0±0.67; v, m/s - 0.29±0.07 and 0.21±0.07; microbial content, thousand/m^3 - 41.6±1.47 and 29.3±1.13; concentration of NH_3, mg/m^3 - 14.1±0.60 and 7.9±0.33; the level of H_2S, mg/m^3 - 8.3±0.27 and 3.7±0.21; the amount of CO_2,% - 0.17±0.01 and 0.15±0.01; solid aerosol content, mg/m^3 - 5.1±0.21 and 2.7±0.17 (table 1).

Table 1 – Indices of the air basin in the animal premises

Indicators	Premises	
	cowshed	maternity ward
Temperature, ^{o}C	9.9 ± 0.24	14.9 ± 0.41
Relative humidity, %	71.3 ± 1.11	70.0 ± 0.67
Air velocity, m/s	0.29 ± 0.07	0.21 ±0.07
Light factor	1: 15	1 : 14
Coefficient of natural illumination, %	0.71 ± 0.03	0.86 ± 0.05
The concentration of air pollutants:		
NH_3, mg/m^3	14.1 ± 0.60	7.9 ± 0.33
H_2S, mg/m^3	8.3 ± 0.27	3.7 ± 0.21
CO_2, %	0.17 ± 0.01	0.15± 0.01
Bacterial contamination, thousand/m^3	41.6 ± 1.47	29.3 ± 1.13
Dust content, mg/m^3	5.1 ± 0.21	2.7 ± 0.17

The natural illumination in the indicated premises for cows with geometric standardization (light factor) was 1:15 and 1:14, and with lighting standardization (coefficient of natural illumination) it was 0.71±0.03 and 0.86±0.05%, respectively.

It was established that intramuscular administration to the cows of the 1st experimental group of ASD-F2 with eleovitis in a ratio of 1:9 60 days before the expected calving, and the animals of the 2nd experimental group - the Prevention series drugs developed by us three times with an interval of 10 days in the last decades of dry period at a dose of 10 ml had no impact on the parameters of the physiological state of animals. The indicators were within normal limits and the difference compared with the control group was insignificant (P>0.05) (table 2).

Table 2 – Physiological indicators of cows

Group of animals	The observation period, days		Body temperature, ^{o}C	Pulse rate, fluctuations/min	Respiratory rate, breaths/min
	Before calving	After calving			
Control	35 – 30		38.1±0.14	76±1.20	21±0.62
	15 – 10		38.1±0.10	77±0.82	22±0.55
	10 – 5		38.0±0.10	77±0.93	22±0.28
		3 – 5	38.2±0.08	76±1.03	22±0.32
1 experimental*	35 – 30		38.1±0.20	75±1.78	21±0.68
	15 – 10		38.0±0.10	76±1.12	22±0.51
	10 – 5		38.2±0.09	76±0.93	22±0.26
		3 – 5	38.2±0.11	76±1.82	22±0.58
2 experimental**	35 – 30		38.3±0.02	76±0.93	21±1.20
	15 – 10		38.1±0.12	77±0.65	22±0.72
	10 – 5		38.2±0.09	77±0.26	22±0.03
		3 – 5	38.1±0.93	76±0.72	22±0.24

* The injection period of ASD-F2 with eleovitis in a ratio of 1:9 - 60 days before calving;
** The injection period of the Prevention series drug: 45-40 days, 25-20 days and 15-10 days before calving.

The body temperature of the experimental cows corresponded to physiological norms: in the control group - 38.0±0.10 - 38.2±0.08 °C, in the 1st experimental group - 38.0±0.10 - 38.2±0.11 and in the 2nd experimental group - 38.1±0.12 - 38.3±0.02 °C.

A slight increase in the pulse rate in cows by the end of the dry period compared with previous studies was noted: in the control group - up to 77±1.82 fluctuations/min, in the first experimental group - up to 76±1.12 and in the second experimental group - up to 77±0.65 fluctuations/min. 3-5 days after calving, the pulse rate in animals of the experimental groups also did not undergo significant changes, and only a slight decrease was detected in the control group (76±1.03 fluctuations/min) and the 2nd experimental group (76±0.72 fluctuations/min), but in cows of the 1st experimental group, it did not change (76±1.82 fluctuations/min).

Respiratory rate indices in cows of the experimental groups were also within physiological norms, and they had a small range of fluctuations: in the control - from 21±0.62 to 22±0.55 breaths/min, in the

1st experimental group - from 21±0.68 to 22±0.58 breaths/min and in the 2nd experimental group - from 21±1.20 to 22±0.72 breaths/min.

The results of clinical and physiological studies of experimental animals indicate that the biological preparations tested by us did not affect their body temperature, pulse rate, and respiratory movements.

It was found that intramuscular administration of biological products in the 1st and 2nd experimental groups helped to reduce the risk of postpartum complications and shortened the recovery time of the reproductive tract of cows, which contributed to their earlier and fruitful insemination (table 3).

Table 3 – Incidence and reproduction rate in cows

Indicator	Group of animals		
	Control	1 experimental	2 experimental
Number of cows	10	10	10
The time of the expulsion of the placenta, h	12.6±1.02	7.2±0.42*	5.8±0.66*
retention of placenta	4	–	–
Subinvolution of uterus	3	1	–
Endometritis	2	1	–
Mastitis	2	–	–
First onset of estrus, days	43.2±1.64	34.6±0.93*	28.8±0.56*
Insemination index	2.6±0.26	1.8±0.24*	1.4±0.36**
Time from calving to fertilization, days	89.2±3.02	64.6±1.62**	57.8±1.50**
Fertilized cows:			
at 1st insemination	2	4	6
at 2nd insemination	2	3	4
at 3rd insemination	6	3	–

* P≤0.05; ** P≤0.01.

The analysis of the data obtained indicates that the use of biological preparations at different times in the 1st and 2nd experimental groups reduced the occurrence of obstetric and gynecological diseases in the postpartum period, and also increased the reproductive quality of cows. Moreover, the best effect was obtained in the 2nd experimental group, where the Prevention series drug was used.

The leukocyte blood profile of cows of the control and experimental groups before and after calving is presented in table 4.

Table 4 – Leukocyte blood profile of cows

Group	The observation period, days		Cow blood leukogram					
			Granulocytes, %				Agranulocytes, %	
			Basophils	Eosinophils	Neutrophils		Lymphocytes	Monocytes
	Before calving	After calving			Band	Segmented		
Control	35 – 30		1.3±0.22	5.1±0.12	4.2±0.15	27.2±0.82	57.8±1.02	5.0±0.74
	15 – 10		1.3±0.31	5.7±0.08	4.7±0.12	27.2±0.42	56.9±1.26	4.4±0.26
	10 – 5		1.2±0.20	4.7±0.12	3.9±0.47	27.5±0.73	58.0±0.88	4.7±0.08
		3 – 5	1.4±0.17	4.7±0.43	4.0±0.30	27.6±0.80	59.1±0.28	4.2±0.45
1 experimental	35 – 30		1.1±0.33	5.4±0.24	3.5±0.46	27.6±0.42	58.3±0.76	5.1±0.34
	15 – 10		1.1±0.25	6.4±0.34	3.1±0.26	27.3±0.58	58.5±0.44	4.6±0.53
	10 – 5		0.9±0.06	5.2±0.66	2.9±0.08	28.5±0.63	58.6±1.76	4.7±0.79
		3 – 5	0.7±0.31	5.7±0.70	2.9±0.32*	27.0±0.96	59.2±0.43*	4.7±0.68
2 experimental	35 – 30		1.1±0.10	5.4±0.22	3.4±0.18	28.2±0.24	58.2±0.53	5.3±0.22
	15 – 10		0.8±0.30	6.7±0.60	2.8±0.18	27.5±0.87	58.4±0.10	4.7±0.03
	10 – 5		0.4±0.40	5.9±0.12	3.0±0.28	27.8±1.36	58.9±0.03	5.1±0.46
		3 – 5	0.5±0.18	5.5±0.82	3.1±0.26**	27.3±0.68	59.8±1.08**	4.5±0.23

* P<0.05; ** P<0.01.

The analysis of the leukocyte formula showed that a change in the number of basophils in the blood of animals from the control and experimental groups, regardless of the observation period before and after calving, was statistically unreliable. The indicated granulocytes in the blood of down-calving and newly-calved cows varied in a small range: in the control - from 1.2±0.20 to 1.4±0.17%, in the 1st experimental group - from 0.7±0.31 to 1.1±0.33% and in the 2nd experimental group - from 0.4±0.40 to 1.1±0.10%.

If the content of eosinophils in the blood of experimental cows of the control, 1st and 2nd experimental groups increased in the last period of pregnancy during 35-30 - 15-10 days before calving from 5.1±0.12 to 5.8±0.08 %, from 5.4±0.24 to 6.2±0.24% and from 5.4±0.22 to 6.7±0.60%, then 10-5 days before calving, there was a decrease in these granulocytes up to 4.7±0.12%, 5.2±0.66%, and 5.9±0.12%, respectively. If the content of eosinophils in the blood remained unchanged in newly-calved cows of the control group (4.7±0.43%), then in the 1st experimental group it increased (5.7±0.70%), and in the 2nd, vice versa - decreased (5.5±0.82%). The number of eosinophils in the blood of animals of the 1st and 2nd experimental groups was higher in comparison with the control 35-30 days before calving by 0.3 and 0.3%, 15-10 days before calving - by 0.7 and 1.0%, 10-5 days before calving - by 0.5 and 1.2% and 3-5 days after calving - by 1.0 and 0.8%, however, these changes were statistically unreliable.

Taking into account that eosinophils are a stress testing factor, a decrease in their content in the blood 10-5 days before calving and 3-5 days after calving indicates that the animals experienced stress, that is, calving is a stress factor. However, taking into account that the number of these formed elements was greater in the blood of animals of the experimental groups, it can be assumed that the bio preparations used had an insignificant, but anti-stress effect.

It was found that the content of band neutrophils in the blood of cows of the control, 1st, and 2nd experimental groups consistently decreased by calving, namely, in the period from 35-30 to 10-5 days before calving from 4.2±0.15 to 3.9±0.47%, from 23.5±0.46 to 2.9±0.08% and from 3.4±0.18 to 3.0±0.28%, respectively. 3-5 days after calving in animals of the control and 2nd experimental groups, the data of this indicator increased to 4.0±0.30 and 3.1±0.26%, respectively, while in the 1st experimental group unchanged - 2.9±0.32%. It should be noted that the content of band neutrophils in the blood of cows of the 1st and 2nd experimental groups was lower than in the control: 35-30 days before calving - by 0.7 and 0.8%, for 15-10 days before calving - by 1.6 and 1.9%, 10-5 days before calving - by 1.0 and 0.9% and on 3-5 days after calving - by 1.1 ($P<0.05$) and 0.9% ($P<0.05$), respectively.

The dynamics of segmented neutrophils in the blood of experimental cows before and after calving gave no specific pattern. However, it should be mentioned that if the number of these forms of neutrophils in the blood of cows of the 1st and 2nd experimental groups before calving turned out to be higher than in the control: 30–25 days before calving by 0.4 and 1.0%, 15 -10 days before calving - by 0.1 and 0.3%, 10-5 days before calving - by 1.0 and 0.3%, then 3-5 days after calving, on the contrary, lower by 0.6 and 0.3% ($P>0.05$), respectively.

Considering that neutrophils have pronounced phagocytosis, the established qualitative changes in the stages of their development indicate the activation of the cell link of nonspecific resistance of the body under the influence of approved biological products.

It was found that if the content of lymphocytes in the blood of cows of the control group varied in the observation time before and after calving from 56.9±1.02 to 59.1±0.60%, then in the 1st and 2nd experimental groups it is consistently increased from the beginning of the experiment to its end from 58.3±0.76 to 59.2±0.43% and from 58.2±0.53 to 59.8±1.08%. Moreover, the number of lymphocytes in the blood of animals of the 1st and 2nd experimental groups for the entire research period was higher than in the control: 35-30 days before calving - by 0.5 and 0.4%, 15-10 days before calving - by 1.6 and 1.5%, 10-5 days before calving - by 0.6 and 0.9% and 3-5 days after calving - by 0.1 and 0.7% respectively ($P< 0.05$).

The obtained data allow us to conclude that the used biological preparations activated the production of lymphocytes by the hematopoietic organs. A more pronounced immunostimulating effect was exerted by the Prevention series biological products.

The number of monocytes in the blood of cows of the 1st experimental group was higher compared to control data for 35-30 days before calving - by 0.1%, 15-10 days before calving - by 0.2% and 3-5 days after calving - by 0.5% ($P>0.05$). Animals of the 2nd experimental group also exceeded the control peers in terms of blood monocytes at certain periods of observation: 35-30 days before calving - by 0.3%, 15-10 days before calving - by 0.3%, 10 -5 days before calving - by 0.4% and 3-5 days after calving - by

0.3%. However, the established changes were unreliable, that is, the biological preparations used did not affect the production of these blood cells.

Conclusion. Activation of the nonspecific resistance of the organism of pregnant cows by the Prevention series biological preparations prevents the occurrence of postpartum diseases, thereby improving the reproductive qualities of black-and-white cattle. Intramuscular administration of the Prevention series biological drugs to cows 35-30 days, 15-10 and 10-5 days before calving activates cellular factors of nonspecific protection and stress resistance of the body, as evidenced by our physiological leukocytosis, moderate neutropenia with a right nuclear shift, lymphocytosis, and eosinophilia.

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БИОПРЕПАРАТТАРДЫ ҚОЛДАНҒАННАН КЕЙІНГІ СИЫРЛАРДЫҢ РЕПРОДУКЦИЯЛЫҚ (ТӨЛ АЛУ) САПАСЫ

Аннотация. Ірі қара малшаруашылығы жұмысының негізгі бағытының бірі – сиыр өнімділігінің сапасын арттыру және сапалы төл алу. Өкінішке қарай, осы аталған жұмыстың шаруашылықта жүзеге асырылуы көңіл толтырарлық деңгейде емес. Осыған байланысты, мал мамандары қызметінің қазіргі таңдағы негізгі мақсатының бірі – сиыр малының өнімділігін арттыру, сонымен қатар, оның репродукциялық сапасын да жоғарғы деңгейге көтеру.

Аталмыш ғылыми жұмыстың мақсаты – соңғы кезде жаңадан шыққан биопрепараттарды қолдану арқылы сиыр малы организмінің қорғаныс факторларының белсенділігін арттыра отырып, олардың реподукциялық (төл алу) сапасына әсерін зерттеу.

Зерттеуге алынған қарала сиырларды үш топқа бөлдік. Сиыр топтарының азықтануы мен бағып-қағу жағдайлары бірдей жағдайда өтті. Жоғарыда баяндағандай, тәжірибенің мақсаты – буаз сиырлар организмінің қорғаныс факторлар белсенділігін арттыру, туғаннан кейінгі кезеңде әдетте өрбитін аурулардың алдын алу және малдың көбею сапасының биоресурстық потенциялын іс жүзіне асыру. Осы мақсатта Чубаш мемлекеттік ауылшаруашылық академиясы ғалымдарының (В.Г.Семенов т.б) жаңадан шығарған биопрепараты қолданылды. I топтағы тәжірибелік сиырлардың туу мерзіміне 60 тәулік қалғанда бұлшықетіне 1:9 арақатынастағы АСД-Ф2 мен элеовит енгізілді, II тәжірибелік топтағы сиырларға аталған препарат тууы мерзімінің алдындағы соңғы декадасында – 10 тәулік интервалмен 3 рет енгізілді, ал бақылау тобындағы сиырларға аталған биологиялық препарат енгізілмеді.

Клиникалық және физиологиялық зерттеулер нәтижесі бойынша тәжірибеде пайдаланылған жаңа биопрепараттар тәжірибелік топтағы сиыр организмінің дене температурасы, жүрек соғысының саны, сондай-ақ, тыныс алу қозғалысының саны көрсеткішіне көзге түсерліктей әсер тигізбеді.

Тәжірибе нәтижесі бойынша анықталғандай, аталған биопрепараттарды тәжірибедегі сиыр бұлшықетіне енгізу I және II тәжірибелік топтағы сиырларда, әдетте, сиыр туғаннан кейінгі кезеңде өрбитін аурудың асқынуы күрт азайды, сондай-ақ сиырлар жыныс жолдары мүшелерінің қалпына келу мерзімі айтарлықтай қысқарды. Нәтижесінде, сиырларды бұрынғы жылдардағы кезеңмен салыстырғанда ертерек ұрықтандыруға мүмкіндік туды.

Тәжірибе нәтижесінде жиналған ғылыми мәлімет бойынша аталған жаңа биопрепараттарды түрлі мерзімде I және II тәжірибелік топтағы сиырларға қолдану туғаннан кейінгі кезеңде жиі кездесетін акушерлік-гинекологиялық аурудың азаюына үлкен септігін тигізетін, сондай-ақ, сиырдың төл беру сапасының артатынын көрсетті. Сонымен қатар, II тәжірибелік топтағы сиырларға қосымша енгізілген **Prevention сериясының препараты** жоғары тиімді көрсеткіш көрсетті.

Қанның лейкоциттер формуласының көрсеткішін талдау – сиырлардың бақылау және тәжірибелік тобындағы сиыр қанындағы базофиль санының өзгеру көрсеткіші сиырлардың бақылау мерзіміне, сондай-ақ, олардың туғанға дейінгі және туғаннан кейінгі мерзімдеріне қарамастан статистикалық шындыққа сай келмейді. Туу мерзімі жақындаған және жаңа туған сиырлар қанындағы аталған гранулоциттер көрсеткішінің өзгеруі тар диапозонда жүріп, бақылау тобындағы сиырларда 1,2 +0,20%-дан 1,4+0,17%-ға дейін,

I тәжірибелік топтағы сиырларда 0,17+0,31%-дан 1,1+0,33%-ға дейін, ал II тәжірибелік топтағы сиырларда бұл көрсеткіш 0,4+0,40%-дан 1,1+0,10%-ға дейінгі көрсеткішті көрсетті.

Бақылау, I және II тәжірибелік топтағы сиыр қанында эозинофилдер саны буаздықтың соңғы кезеңінде: сиырлардың туу мерзіміне 35-30 күн және 5-10 күндер қалған кезеңде 5,1+0,12%-дан 1,8+0,08-ға дейін және 5,4+0,24% -дан 6,2+0,24% -ға дейін, 5,4+0,22%-дан 6,7+0,60%-ға дейін, ал сиырлардың тууына 10-5 күн қалғанда бұл көрсеткіш 4,7+0,12%-ке төмендеп, аталмыш көрсеткіштер 5,2+0,66% және 5,9+0,12% тең болады. Жаңа туған бақылау тобындағы сиырлар қанындағы эозинофилдер саны өзгеріссіз қалса (4,7+0,43%), I тәжірибелік топтағы сиыр қанындағы эозинофилдер саны көбейген (5,7+0,70%), ал II тәжірибелік топтағы сиырларда бұл көрсеткіш, керісінше, азайды (5,5+0,82%). Дегенмен I және II тәжірибелік топтағы сиырлар қанындағы эозинофилдер саны – бақылау тобындағы сиырлар қанындағы эозинофилдер санына қарағанда сиырлардың туу мерзіміне 35-30 күн қалғанда 0,3% және 0,3%-ға, ал 5-10 күн қалғанда 0,7% және 1,0%, ал туу мерзіміне 10-5 тәулік қалғанда бұл көрсеткіш 0,5% және 1,2%, ал бұзау туғаннан кейінгі 3-5 тәулік ішінде 1,0% және 0,8% көрсетті. Айта кету керек, байқалған өзгерістер статистикалық шындыққа сай келмейді.

Жалпыға белгілі, жануарлар қанындағы эозинофилдер – стресс-тестілік фактор болып саналады. Демек, сиырлардың туу мерзіміне 10-5 тәулік қалғанда, сондай-ақ, туғаннан кейінгі 3-5 тәулікаралық мерзім ішіндегі сиырлар қанында эозинофилдер санының азаюы – сиырлардың стрестен өткендігінің белгісі. Бұл жерде айта кеткен жөн болар, аталмыш көрсеткіштердің тәжірибелік топтардағы сиырлар қанында – бақылау топтарындағы сиырлар қанындағы осындай көрсеткіштерден көп болуы – қолданылған биопрепараттар сиыр организміне азды-көпті антистрестік ықпал етті деп тұжырымдаймыз.

Тәжірибе арқылы анықталғандай, бақылау I және II тәжірибелік топтағы сиырлар қанында таяқша ядролы нейтрофилдер саны сиырлардың туу мерзіміне жақындаған сайын жүйелі түрде азая берді. Дәлірек айтсақ, сиырлардың туу мерзіміне 35-30 және 10-5 тәулік уақыт қалғанда I топтағы сиырларда бұл көрсеткіш 4,2+ 0,15%-дан 3,9 + 0,47%-ға дейін, ал II топтағы сиырларда 23,5 +0,46%-дан 2,9+0,08%-ға және 3,4+0,18%-дан 3,0+0,28%-ға дейін төмендейді. Бұзаулағаннан соң, 3-5 тәулік өткеннен кейін, бақылау және II тәжірибелік топтардағы сиырларда аталмыш көрсеткіш 4,0+ 0,30% және 3,1+0,26 % дейін көтеріледі. Ал, I тәжірибелік топтағы сиырлар қанында бұл көрсеткіш өзгеріссіз қалып, 2,9+0,32 % тең болды. Айта кету керек, I және II тәжірибелік топтағы сиырлар қанында таяқша ядролы нейтрофильдер саны төмен болды. Бұл көрсеткіш бұзаулар туатын мерзімнен 35-30 тәулік бұрын 0,7% және 0,8%-ға, бұзаулар туатын мерзімнен 15-10 тәулік бұрын 1,6% және 1,9%-ға, ал 10-5 тәулік бұрын 1,0% және 0,9%-ға, бұзаулар туғаннан 3-5 тәулік өткеннен кейін 1,1% (P 0,05) және 0,9%-ға (P 0,05) төмендейді.

Тәжірибеге алынған сиырлар қанының сегментті ядролы нейтрофильдер динамикасында буаз сиырлар туғанға дейінгі және туғаннан кейінгі кезеңдерде айтарлықтай заңдылықтар байқалмады. Бірақ, айтып өткен жөн, жануар қанындағы нейтрофильдердің осы аталған түрі – сиырлар бұзаулаған кезеңге дейін, сиырлардың I және II тәжірибелік топтары қанында бақылау тобындағы сиырлардың осындай көрсеткіштеріне қарағанда жоғары болды, дәлірек айтсақ, сиырлар бұзаулайтын мерзімнен 30-35 тәулік бұрын, I және II тәжірибелік сиырлар тобы бойынша 0,4% және 1,0 %-ға, 5-10 тәулік бұрын 0,1% және 0,3%, 10-5 тәулік бұрын 1,0% және 0,3% жоғары көрсеткішті көрсетсе, бұзаулағаннан 3-5 күн өткеннен кейін аталмыш көрсеткіш тәжірибелік топтардағы сиырларда, керісінше, 0,6% және 0,3%-ға дейін төмендеді (P 0,05).

Қан нейтрофильдерінің фагоцитоз үдерісін белсенді жоғары деңгейде іс жүзіне асыратынын назарға алғанда онда сиырларға енгізілген жаңа биопрепараттардың тәжірибелік сиырлар организмдерінің түрлі ауру тудыратын факторларға қарсы тұру қабілетінің күшеюіне зор ықпал ететінін байқаймыз.

Сиыр қаны лимфоциттерінің саны бақылау тобындағы сиырларда бұзаулардың туғанға және туғаннан кейінгі мерзімдерде: 56,9+1,02%-дан 59,1+0,60%-ға дейін өзгеріп отырса, I және II тәжірибелік сиыр тобы қанындағы лимфоциттер саны тәжірибе басталғаннан бастап, I топта 58,3+0,76%-дан соңына дейін 59,2+0,43%-ға және II топта 58,2+0,53%-дан 59,8+1,08%-ға дейін өсті. I және II тәжірибелік топтағы сиырлар қанында лимфоциттер саны тәжірибе жүргізу кезеңдерінде бақылау тобындағы сиырлар қанындағы лимфоциттер санына қарағанда жоғары болғанын айтқан жөн. Дәлірек айтсақ, сиырлар бұзаулайтын мерзімнен 35-30 тәулік бұрын 0,5% және 0,4%-ға, 15-10 тәулік бұрын 0,6% 0,9%-ға, ал бұзаулар туғаннан 3-5 күннен кейін 0,1% және 0,7% көрсетті (P 0,05).

Жүргізілген тәжірибе негізінде алынған мәліметтер бойынша тәжірибеде қолданылған жаңа биопрепараттар – сиыр организмінің иммундық қорғаныс белсенділігін күшейтіп, қан түзу мүшелеріндегі лимфоциттердің түзілу белсенділігін арттырды. **Prevention сериясының биопрепараты** айқын да, тиімді ықпал етті.

Сиыр қанындағы моноциттер саны – I тәжірибелік топтағы сиырлар қанында бақылау тобындағы сиырлардың осындай мәліметіне қарағанда жоғары болды: сиырлардың бұзаулау мерзімінен 35-3 тәулік бұрын 0,1%, 15 -10 тәулік бұрын 0,2% және бұзаулар туғаннан 3-5 күн өткеннен кейін 0,5% (P 0,05) көрсетті. II тәжірибелік топтағы сиыр қанының моноциттер саны бақылау тобының осындай көрсеткіштерінен жоғары болды: сиырлардың бұзаулау мерзімінен 35-30 тәулік бұрын 0,3%-ға, 15 -10 тәулік бұрын 0,3%-ға,

10-5 тәулік бұрын 0,4%-ға және бұзау туғаннан 3-5 күн өткеннен кейін де 0,3%-ға жоғарылаған. Бірақ алынған ғылыми мәліметтер айырмашылығы статистикаға сай келмейді, яғни пайдаланылған биопрепараттар организмнің иммундық қорғанысын қамтамасыз ететін қан жасушаларының түзілуіне толық мөлшерде ықпал ете алмайды.

Түйін сөздер: сиыр, буаздық, биопрепарат, иммундық қорғаныс, гематологиялық профиль.

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РЕПРОДУКТИВНЫЕ КАЧЕСТВА КОРОВ ПРИ ПРИМЕНЕНИИ БИОПРЕПАРАТОВ

Аннотация. Воспроизводительные качества и продуктивность коров представляют собой главное звено в скотоводстве. Однако эти качества у коров реализуются недостаточно, и перед скотоводством встает задача их повышения.

Целью настоящей работы является изучение воспроизводительных качеств коров на фоне активизации неспецифических защитных факторов организма биопрепаратами нового поколения.

Условия содержания и кормления коров всех групп были одинаковыми. С целью активизации неспецифической резистентности организма стельных коров, профилактики болезней послеродового периода и реализации биоресурсного потенциала воспроизводительных качеств черно-пестрого скота использовали биопрепарат нового поколения, разработанный учеными ФГБОУ ВО Чувашская ГСХА (В.Г. Семенов и др.). В 1-й опытной группе коровам за 60 суток до предполагаемого отела внутримышечно вводили АСД-Ф2 с элеовитом в соотношении 1:9, во 2-й опытной группе применялся разработанный препарат в дозе 10 мл трехкратно с интервалом 10 суток в последние декады стельности, а в контроле указанные препараты животным не инъецировали.

Результаты клинико-физиологических исследований подопытных животных свидетельствуют о том, что апробированные нами биопрепараты не оказали влияние на температуру их тела, частоту сердечных сокращений и дыхательных движений.

Установлено, что внутримышечное введение биопрепаратов в 1-й и 2-й опытных группах способствовало уменьшению риска возникновения послеродовых осложнений и сокращало сроки восстановления половых путей коров, что способствовало более раннему и плодотворному их осеменению.

Анализ полученных данных свидетельствует о том, что применение биопрепаратов в разные сроки в 1-й и 2-й опытных группах снижало возникновение акушерско-гинекологических заболеваний в послеродовом периоде, а также повышало воспроизводительные качества коров. При этом лучший эффект получен во 2-й опытной группе, где был применен препарат серии Prevention.

Анализ лейкоцитарной формулы показал, что изменение количества базофилов в крови животных контрольной и опытных групп независимо от срока наблюдения до и после отела было статистически недостоверным. Указанные гранулоциты варьировали в крови глубокостельных и новотельных коров в узком диапазоне: в контроле – с 1,2±0,20 до 1,4±0,17 %, в 1-й опытной группе – с 0,7±0,31 до 1,1±0,33 % и во 2-й опытной группе – с 0,4±0,40 до 1,1±0,10 %.

Если количество эозинофилов в крови подопытных коров контрольной, 1-й и 2-й опытных групп повышалось в последний период стельности за 35-30 – 15-10 суток до отела с 5,1±0,12 до 5,8±0,08 %, с 5,4±0,24 до 6,2±0,24 % и с 5,4±0,22 до 6,7±0,60 %, то за 10-5 суток до отела отмечено понижение указанных гранулоцитов до 4,7±0,12 %, 5,2±0,66 % и 5,9±0,12 % соответственно. Если у новотельных коров контрольной группы количество эозинофилов в крови осталось неизменным (4,7±0,43 %), то в 1-й опытной группе – увеличилось (5,7±0,70 %), а во 2-й, наоборот – уменьшилось (5,5±0,82 %). Количество эозинофилов в крови животных 1-й и 2-й опытных групп было выше по сравнению с контролем за 35-30 суток до отела на 0,3 и 0,3 %, 15-10 суток до отела – на 0,7 и 1,0 %, 10-5 суток до отела – на 0,5 и 1,2 % и через 3-5 суток после отела – на 1,0 и 0,8 %, однако эти изменения были статистически недостоверными.

Учитывая, что эозинофилы являются стресс-тестирующим фактором, уменьшение их количества в крови за 10-5 суток до отела и на 3-5 сутки после отела свидетельствует о том, что животные испытывали стресс, то есть отел является стресс-фактором. Однако, учитывая, что количество этих форменных элементов

было больше в крови животных опытных групп, можно предположить, что использованные биопрепараты оказывали хотя и незначительное, но антистрессовое действие.

Установлено, что содержание палочкоядерных форм нейтрофилов в крови коров контрольной, 1-й и 2-й опытных групп последовательно снижалось к отелу, а именно в период за 35-30 – 10-5 суток до отела с 4,2±0,15 до 3,9±0,47 %, с 23,5±0,46 до 2,9±0,08 % и с 3,4±0,18 до 3,0±0,28 % соответственно. Через 3-5 суток после отела у животных контрольной и 2-й опытной групп данные этого показателя повысились до 4,0±0,30 и 3,1±0,26 % соответственно, в то время как в 1-й опытной группе остались неизменными – 2,9±0,32 %. Следует констатировать тот факт, что содержание палочкоядерных нейтрофилов в крови коров 1-й и 2-й опытных групп было ниже, нежели в контроле: за 35-30 суток до отела – на 0,7 и 0,8 %, за 15-10 суток до отела – на 1,6 и 1,9 %, за 10-5 суток до отела – на 1,0 и 0,9 % и на 3-5-е сутки после отела – на 1,1 ($P<0,05$) и 0,9 % ($P<0,05$) соответственно.

В динамике сегментоядерных нейтрофилов в крови подопытных коров до и после отела не выявлено определенной закономерности. Однако следует отметить, что если количество этих форм нейтрофилов в крови животных 1-й и 2-й опытных групп до отела оказалось выше, чем в контроле: за 30-25 суток до отела на 0,4 и 1,0 %, за 15-10 суток до отела – на 0,1 и 0,3 %, за 10-5 суток до отела – на 1,0 и 0,3 %, то через 3-5 суток после отела, наоборот, ниже – на 0,6 и 0,3 % ($P>0,05$) соответственно.

Учитывая, что нейтрофилы обладают выраженным фагоцитозом, установленные качественные изменения в стадиях их развития свидетельствуют об активизации клеточного звена неспецифической резистентности организма под воздействием апробированных биопрепаратов.

Установлено, что если содержание лимфоцитов в крови коров контрольной группы варьировало в исследуемые сроки до и после отела с 56,9±1,02 до 59,1±0,60 %, то в 1-й и 2-й опытных группах оно последовательно повышалось от начала опыта к его концу с 58,3±0,76 до 59,2±0,43 % и с 58,2±0,53 до 59,8±1,08 %. Причем количество лимфоцитов в крови животных 1-й и 2-й опытных групп за весь период исследований было выше, чем в контроле: за 35-30 суток до отела – на 0,5 и 0,4 %, за 15-10 суток до отела – на 1,6 и 1,5 %, за 10-5 суток до отела – на 0,6 и 0,9 % и через 3-5 суток после отела – на 0,1 и 0,7 % ($P<0,05$) соответственно.

Полученные данные позволяют заключить, что использованные биопрепараты активизировали продукцию лимфоцитов кроветворными органами. Более выраженный иммуностимулирующий эффект оказывал биопрепарат серии Prevention.

Количество моноцитов в крови коров 1-й опытной группы было выше по сравнению с контрольными данными за 35-30 суток до отела – на 0,1 %, за 15-10 суток до отела – на 0,2 % и через 3-5 суток после отела – на 0,5 % ($P>0,05$). Животные 2-й опытной группы также превосходили контрольных сверстниц по уровню моноцитов в крови в отдельные сроки исследований: за 35-30 суток до отела – на 0,3 %, за 15-10 суток до отела – на 0,3 %, за 10-5 суток до отела – на 0,4 % и через 3-5 суток после отела – на 0,3 %. Однако установленные изменения оказались недостоверными, то есть использованные биопрепараты не повлияли на продукцию этих форменных элементов крови.

Ключевые слова: коровы, стельность, биопрепараты, неспецифическая резистентность, гематологический профиль.

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DYNAMIC MODELING OF AGRICULTURAL COMPANY ASSET MANAGEMENT PROCESS

Abstract. The article is aimed at describing possibilities to use methodological tools of dynamic modeling to manage the assets of economic entities, and agricultural companies in particular.

Methods. The research uses the method of dynamic programming. All classes of dynamic programming problems are solved by the method of recurrence relations, which are made on the basis of the optimality principle. Strategic modeling and taxonomic analysis methods are also used to build a program-targeted model for asset management of agricultural companies.

Results. The article proposes to consider asset management of agricultural companies as a purposeful systematic influence on the factors and conditions that accompany the selection processes, combination and revitalization of economic resources, their productive use as assets of an economic entity to obtain economic benefits, sustainable development and competitiveness of the enterprise in the target market. Therefore, the asset management process of the enterprise U should be formalized as a set U = {u1, u2, u3, u4}, which can be detailed by distinguishing the influence of managing a particular asset type upon the value of the modified development factor d_i of the enterprise. Namely: u_1 (influence of intangible fixed asset management), u_2 (influence of tangible fixed asset management), u_3 (influence of tangible asset management), u_4 (influence of cash asset management). Consequently, the author has justified a program-targeted model of agricultural company asset management, which includes a strategic matrix, combinatorics of management decisions, taxonomic analysis and forecast of changes using strategic alternatives and proposed policies for managing individual asset types. The author also gives calculation of changes in the modified development ratio of the agricultural company-respondent of the study (d_i) and suggests a set of policies to manage fixed, tangible and cash assets of the research respondent within the identified strategic vector.

Conclusions. The method of dynamic programming is the most adapted to the solution of discrete problems, which in most cases are management and control tasks. The study concluded that the method can be used to describe and analyze dynamic objects within the time for efficient management. Therefore, the author offered a program-targeted asset management model for agricultural companies using this method. This gives the opportunity to stratify the choice of agricultural company asset management policies within the identified strategic outline.

Key words: assets, dynamic modeling, process approach, model of asset management, combinatorics of management decisions, taxonomic analysis, forecast.

Introduction. The activities of agricultural companies under dynamic market changes and intense global competition is determined by their economic potential and their correspondence to market opportunities. The dynamics of the enterprise and its ability to respond to everyday challenges depends on the quality of the available resources. The struggle between the subjects of economic relations for limited resources is transformed into a strategic interaction, which involves the synchronization of the pace of development and the trajectories of their evolution, but not their acquisition or merger. [1] Structural transformation of the economy should be aimed at maximizing the efficient use of all types of economic resources, assets, competences. It requires implementation of active and consistent innovative and investment policy, development of the national innovative system, improvement of the industrial complex directed to expansion of high-tech manufacturing industries, telecommunications, financial and business services, development of highly intellectual human capital. The modern prospects for innovative

development of domestic agricultural production will be determined by the opportunities to use the benefits of its diversification both in terms of the commodity structure and in increasing its share that is currently in growing demand in the world.

Materials and research methods. Considering the fact that, in the general sense, business asset management should be considered as purposeful systematic impact on the factors and conditions that accompany the processes of selection, combination and revitalization of economic resources, as well as their productive use for economic benefit, sustainable development and competitiveness of the enterprise in a particular market, it is necessary to formalize the asset management model.

To formalize the model, the study uses a dynamic programming method that consists of a series of interrelated steps. The necessary conditions for applying this method are: the purpose function should consist of the sum of functions, each function depends only on the corresponding variable; the task must be interpreted as a multi-step decision-making process; the task must be defined for an arbitrary number of steps and have a structure that does not depend on their number. The state of the dynamic programming control system is given in figure 1, where u_k - is the managerial influence on k^{th} step (k = 1, 2, 3… n); S_k - is the state of the system on step k - 1 (k = 1, 2, 3… n).

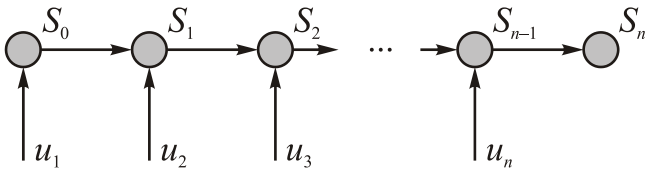

Figure 1 – State of the control system by the dynamic programming method

All classes of dynamic programming problems are solved by the method of recurrence relations, which are based on the principle of optimality, developed by American mathematician Richard Bellman in 1953 [1]: *"Whatever the state of the system before the next step, the management of this step should be chosen so that the efficiency of the step under consideration plus the optimum efficiency of all subsequent steps is maximized."*

Therefore, in the process of management optimization by the method of dynamic programming, the multi-step process must be "passed through" twice. Firstly - from the end to the beginning, as a result of which we find conditional optimal management decisions and conditional optimal benefits at all steps (periods). Secondly - from start to finish, which results in optimal management decisions at each step (stage) and, respectively, optimal management of the process as a whole. This requires the development and use of a unified model of enterprise asset management.

Research results. The basic ability of agricultural companies is the ability to predict the future and correlate their actions along with it, determine the direction of production for the enterprise; ability to learn and change; the ability to adopt long-term plans, attract the right specialists to the enterprise, build up partnerships; ability to generate cash flow, generate profits and increase capitalization. The abilities listed above represent the level of mechanisms aimed at developing new capabilities of the enterprise, which is certainly a prerequisite for the existence of the enterprise in the future.

Considering the use of dynamic modeling to describe the process of agricultural enterprise asset management we should define the economic category of "assets of the enterprise". In the context of our research, assets of the enterprise are the variable part of its economic resources that is selected by the entity to carry out business activities on the basis of the approved business model, taking into account its capability, time and risk factors with the aim to bring economic benefits and to ensure competitiveness of the enterprise on a specific market. Normally, assets of agricultural companies have a large proportion of fixed components in their structure. However, the desire of individual agricultural producers to increase productivity due to the use of better raw materials leads to an increase in the proportion of tangible assets.

As a result of a thorough taxonomic analysis of the nature and systemic qualities of the enterprise assets [2], structural-genetic analysis of models that manage them, the research proposes a program-targeted model for agricultural company asset management. Based on the mission and goals of the enterprise, the model consists of a strategic matrix, combinatorial management decisions, taxonomic analysis and forecast of twenty indicators of condition assessment, efficiency and financial security of the

asset use (X1-X20) with the subsequent calculation of the modified development ratio of the respondent of the research *(d_i)*.

The first element of this model illustrates the dependence of its choice on the corporate strategy of the entity [3,4,5,6]. This, in turn, predetermines a set of tactical actions that are integrated into a particular asset management policy of the enterprise.

For the most part, the mission of a modern agricultural enterprise is to produce products to meet the needs of the consumer market and maximize profits. However, in our study, we emphasize the need for the society to proceed to the environmental economy, which, in turn, requires a clarified mission of the modern agricultural company. It is necessary to change the human attitude to the nature as a conqueror (he takes as much as he wants) to the position of an equal inhabitant of the planet, who cares for the reproduction of natural resources, to provide them for future generations. Therefore, when choosing an economic resource to transform into a company asset, one must keep in mind the resource constraint: "natural resources are never enough to meet all the needs at a given level of economic development." Therefore, in our opinion, the mission of a modern agribusiness is to produce products to meet the needs of the consumer market and to maximize profits through the harmonized use and reproduction of economic resources.

It should be noted that the relevance of strategic alternatives to the underlying strategy should not be seen as invariable: they may overlap. However, each and every of the basic corporate strategies has quite many alternatives for implementation. In turn, strategic alternatives are implemented through appropriate policies. In the context of our study, under the *company asset management policy $П_{ac}$* we should imply the complex of economically weighted measures for transforming economic resources into assets of an entity and their further productive use in order to achieve strategic goals of the enterprise.

Figure 2 details the strategic matrix of the program-target model of enterprise asset management, a key element of which is the matrix of relevant management policies.

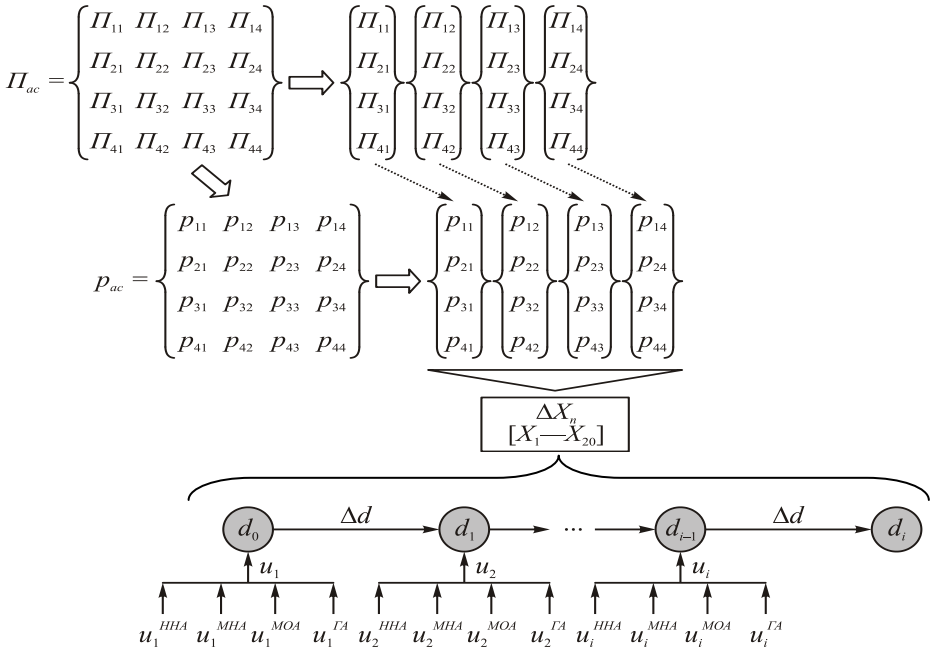

Figure 2 – Logic and combinatorics of decision making on enterprise asset management

The matrix for corporate asset management policy can be viewed both at the angle of the strategic vector set and at the angle of the cluster set of the respective type of asset. The strategic vector set characterizes a complex of policies for managing different types of assets within the framework of the implementation of one of the corporate strategies (growth, restructuring, stabilization, survival). In turn, the cluster set is a combination of asset management policies according to the asset type (intangible fixed assets, tangible fixed assets, tangible assets, cash assets).

Each cluster of agricultural company asset management policies considers a set of actions to locate, attract, and efficiently use a certain type of asset.

The first cluster is based on the results of a person's intellectual activity to obtain an intellectual product that may become an intangible asset of the entity. As a primary basis for product innovation, intellectual products are beneficial to businesses through their industrial suitability, cost-efficiency, profitability when used in manufacturing, and product sales (service delivery). That is why their value as an industrial property object - an intangible asset of an enterprise - is increasing.

The second is based on the probable ways of reproducing and updating fixed assets under existing depreciation models. The rational application of depreciation calculation method at the enterprise is an important element of its corporate governance and enables the management of the enterprise to expand production or create a new line of business.

The third policy cluster describes a set of measures to make use of current assets more efficiently - reducing inventory levels, reducing storage and transportation costs (many tenants who have found themselves less creditworthy due to decline in their business affairs are forced to look for inventory management models that aim to optimize their own costs), increase the efficiency of the business, and improve customer service.

The fourth cluster solves the issue of maintaining a minimum balance of funds for smooth running current calculations; taking into account the range of seasonal changes in cash balances; creating free cash reserve in case of possible expansion of the company activity; forming a reserve of cash assets to compensate for unforeseen expenses and possible losses in the course of financial and economic activities, etc.

In order to develop and implement the enterprise asset management policy, it is necessary to describe the isolated clusters and identify the impact factors using the above mentioned taxonomic efficiency analysis of formation and use of the company assets. It is clear that the stated management policy does not aim to change all factors of multidimensional analysis. It approaches management influence differentially depending on the strategic vector within the overall corporate strategy of the enterprise.

Table 1 outlines the author's vision for the contents of agricultural company asset management policies and identifies the impact factors that are to be changed in the implementation of the selected policy.

Table 1 – Company asset management policies*

Cluster	Policy	Description	Impact factors
1. Intangible fixed assets management policies	$П_{11}$	*Breakthrough policy* aimed at generating ideas for the development / acquisition and use of fundamentally new intangible assets that may increase the potential of an agricultural company and create new competitive advantages	X_5, X_6, X_{14}, X_{20}
	$П_{12}$	*Improvement policy* aims to develop a set of measures to search for intangible assets that can improve existing technologies and technical (organizational, etc.) decisions to ensure the competitiveness of the agricultural company in the target market	
	$П_{13}$	*Savings policy* aims at developing / acquiring intangible assets that are capable of securing a gain in the cost of production and more complete using the potential of an agricultural company and protecting its goodwill	
	$П_{14}$	*Opportunity revaluation policy* is aimed at finding such intangible assets that would be useful in the process of rehabilitation and search for new niches, markets for the presence of the agricultural company	
2. Tangible fixed assets management policies	$П_{21}$	*The progressive (proactive) policy* of tangible fixed assets management is aimed at its rapid updating with radically new fixed assets, capable of providing the agricultural company with competitive advantages	$X_1, X_2, X_3, X_4, X_7, X_{14}, X_{20}$
	$П_{22}$	*A reactive tangible asset management policy* aims to respond quickly to changes in the environment by reactively updating fixed tangible assets, i.e. it should be sensitive to scientific and technological progress	
	$П_{23}$	*Adaptive tangible fixed asset management policy* is designed to adjust the process of reproduction of depreciation assets to the changes in the external environment and internal capabilities of the agricultural company, it is best suited to the type of such enterprises	
	$П_{24}$	*Defensive tangible fixed asset management policy* focuses on finding tools to help reduce production costs	

Continuation of table 1

3. Tangible asset management policies	Π_{31}	*Rebirth policy* is aimed at developing a complex of measures for finding, combining and attracting tangible assets, the use of which can improve the quality and competitiveness of goods (services) of the agricultural company	$X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{17}, X_{18}, X_{19}, X_{20}$
	Π_{32}	*Fast movement policy* focuses on accelerating the turnover of tangible assets and releasing tangible assets to finance other activities of the agricultural company	
	Π_{33}	*Prudent use policy* is aimed at optimizing the size of attracted tangible assets, regulating the size by their degree of importance, forming by an agricultural company a minimum allowable stock, or refusing to form a stock at all	
	Π_{34}	*Anti-entropy policy* involves the revaluation and sale of surplus tangible assets, the choice of a rational model to involve and use them in the course of rehabilitation or liquidation of the enterprise	
4. Cash asset management policies	Π_{41}	*Intensification policy* is directed to ensure profitable use of temporary free cash assets	$X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}$
	Π_{42}	*Long-term investment policy* with timely transformation of free cash into highly liquid financial instruments and its conversion to replenish the balance of agricultural company	
	Π_{43}	*The optimization policy* is based on the maintenance of a minimum balance of cash assets for smooth running of current calculations	
	Π_{44}	*Consideration policy* focuses on building efficient control systems over cash assets of an agricultural company, minimizing financial risk and ensuring economic security	

* Developed by the author.

Due to the rational choice of asset management impact factors, agricultural companies are able to significantly increase the modified development index d_i. This indicator is calculated according to the classical taxonomic analysis algorithm [7, 8]:

1. Formation of the observation matrix of the research respondent:

$$X_{mn} = \begin{pmatrix} X_1 \\ X_2 \\ \cdots \\ X_i \\ \cdots \\ X_m \end{pmatrix} = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{in} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mj} & \cdots & x_{mn} \end{pmatrix}, \quad (1)$$

Performance indicators [X_1, X_2, X_5, X_6, X_7, X_8], of efficiency use [X_3, X_4, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}] and financial security [X_{16}, X_{17}, X_{18}, X_{19}, X_{20}] of company assets.

where m - is the number of units of n-dimensional space that equals to the number of rows of the matrix; n - is the number of attributes of each unit that equals to the number of columns of the matrix; x_{ij} - the value of the attribute by the number j for the unit by the number i.

2. Standardization of values of the matrix elements under observations:

$$z_{ij} = \frac{x_{ij} - m_j}{\sigma_j}, \quad i = 1, \ldots, m; \quad j = 1, \ldots, n, \quad (2)$$

$$\bar{x}_j = m_j = \frac{1}{m} \sum_{i=1}^{m} x_{ij}; \quad (3)$$

$$\sigma_j = \sqrt{\frac{1}{m} \sum_{i=1}^{m} (x_{ij} - m_j)^2}, \quad (4)$$

$$Z_{mn} = \begin{pmatrix} Z_1 \\ Z_2 \\ \cdots \\ Z_m \end{pmatrix} = \begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ z_{m1} & z_{m2} & \cdots & z_{mn} \end{pmatrix}, \quad (5)$$

3. Formation of the vector-standard:

$$z_{0j} = \begin{cases} \max\limits_i \ z_{ij}, & \text{if} \quad j \in I_c; \\ \min\limits_i \ z_{ij}, & \text{if} \quad j \in I_д. \end{cases} \quad (6)$$

* stimulants [X_1, X_3, X_4, X_5, X_6, X_8, X_9, X_{11}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}],
** destimulants— [X_2, X_7, X_{10}, X_{12}].

$$Z_{mn} = (-)\begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ z_{m1} & z_{m2} & \cdots & z_{mn} \end{pmatrix}, \quad (7)$$

$$Z_э = (z_{01}, \ z_{02}, \ \cdots \ z_{0n}) \ .$$

$$Z_E = (Z_{01}, Z_{02}, \ldots, Z_{0n}). \quad (8)$$

4. Determining the distance between the individual observations and the vector-standard

$$c_{i0} = \sqrt{\sum_{j=1}^{n} (z_{ij} - z_{0j})^2} \quad (i = 1, 2, \ldots, m); \quad (9)$$

$$\bar{c}_0 = \frac{1}{m} \sum_{i=1}^{m} c_{i0} \quad (10)$$

$$\sigma_0 = \sqrt{\frac{1}{m} \sum_{i=1}^{m} (c_{i0} - \bar{c}_0)^2}, \quad (11)$$

$$c_0 = \bar{c}_0 + 2\sigma_0, \quad (12)$$

5. Determining the taxonomic development ratio:

$$d_i^* = \frac{c_{i0}}{c_0}; \quad 0 \le d_i^* \le 1, \quad (13)$$

$$d_i = 1 - \frac{c_{i0}}{c_0}., \quad (14)$$

where d_i^* – direct development ratio, where d_i – modified development ratio.

Table 2 considers in more detail the technology of applying dynamic modeling of the asset management on the example of the agricultural company under research. The table summarizes the input data of the research respondent concerning the efficiency of its asset formation and asset use.

Table 2 – Observation matrix of the asset formation efficiency and asset use efficiency of an agricultural company (research respondent) (2013-2019)*

Factor	Indicator	Period						
		2013 p.	2014 p.	2015 p.	2016 p.	2017 p.	2018 p.	2019 p.
X_1	Fixed assets, thousand UAH	1897297	1900797	1555198	1300711	1111516	970051	864227
X_2	Wear ratio, UAH / UAH	0,49	0,49	0,58	0,65	0,70	0,74	0,77
X_3	Fund return, UAH / UAH	1,90	2,00	2,33	2,98	3,71	4,52	5,37
X_4	Return on fixed assets, %	6,30	9,18	11,90	16,99	22,42	28,81	35,72
X_5	Intangible assets, thousand UAH	10700	12200	10980	9882	8894	8004	7204
X_6	Fixed assets, thousand UAH	2089713	2105366	1770854	1527576	1349700	1219652	1125335
X_7	Index of fixed assets, UAH / UAH	2,28	2,36	1,98	1,71	1,51	1,37	1,26
X_8	Tangible assets, thousand UAH	1308136	1317460	1317155	1316850	1316545	1316240	1315935
X_9	Turnover ratio, UAH / UAH	3,07	2,90	3,06	3,23	3,40	3,57	3,75
X_{10}	Duration of one turnover, days	117	124	118	111	106	101	96
X_{11}	Receivables turnover ratio, number of turnovers	10,48	9,01	9,55	10,08	10,61	11,15	11,68
X_{12}	Duration of one receivables turnover, days	34	40	38	36	34	32	31
X_{13}	Return on tangible assets, %	10,2	13,3	15,6	18,4	20,5	22,8	24,9
X_{14}	Return on assets, %	3,49	5,09	6,65	8,52	10,13	11,81	13,41
X_{15}	Profitability ratio of financial activity, UAH / UAH	0,74	0,81	0,89	1,02	1,26	1,98	17,96
X_{16}	Absolute liquidity ratio, UAH / UAH	0,04	0,03	0,03	0,04	0,04	0,05	0,05
X_{17}	Intermediate liquidity ratio, UAH / UAH	0,29	0,22	0,23	0,26	0,28	0,31	0,32
X_{18}	Coverage ratio, UAH / UAH	0,74	0,58	0,60	0,67	0,74	0,80	0,85
X_{19}	Total solvency ratio, UAH / UAH	0,53	0,52	0,60	0,67	0,74	0,80	0,85
X_{20}	Z-ratio by R. Lis model	0,0716451	0,0750135	0,0876450	0,0999634	0,1117010	0,1226765	0,1327787

Using the data in table 2 according to the algorithm of taxonomic analysis, we bring the observation matrix to a standardized form (table 3) and by the formula (6) we determine the coordinates of the vector-standard.

Table 3 – Standardized observation matrix of agricultural company (research respondent) (2013-2019)

Factor	Forecasting period							Coordinates of the vector-standard
	2013p.	2014p.	2015p.	2016p.	2017p.	2018p.	2019p.	
X_1	1,338	1,347	0,468	-0,180	-0,661	-1,021	-1,290	1,347
X_2	-1,334	-1,334	-0,485	0,175	0,647	1,024	1,307	-1,334
X_3	-1,103	-1,022	-0,754	-0,226	0,366	1,024	1,714	1,714
X_4	-1,247	-0,959	-0,686	-0,177	0,366	1,006	1,697	1,697
X_5	0,615	1,534	0,787	0,115	-0,490	-1,035	-1,525	1,534
X_6	1,325	1,368	0,465	-0,191	-0,671	-1,021	-1,276	1,368
X_7	1,234	1,432	0,491	-0,177	-0,672	-1,018	-1,291	-1,291
X_8	-2,418	0,654	0,554	0,453	0,353	0,252	0,152	0,654
X_9	-0,753	-1,355	-0,789	-0,187	0,415	1,016	1,653	1,653
X_{10}	0,709	1,464	0,817	0,062	-0,478	-1,017	-1,556	-1,556
X_{11}	0,135	-1,604	-0,965	-0,338	0,289	0,928	1,555	1,555
X_{12}	-0,336	1,680	1,008	0,336	-0,336	-1,008	-1,344	-1,344
X_{13}	-1,594	-0,957	-0,484	0,091	0,523	0,995	1,427	1,427
X_{14}	-1,485	-1,005	-0,538	0,023	0,506	1,010	1,489	1,489
X_{15}	-0,471	-0,459	-0,446	-0,424	-0,383	-0,261	2,444	2,444
X_{16}	0,000	-1,323	-1,323	0,000	0,000	1,323	1,323	1,323
X_{17}	0,485	-1,496	-1,213	-0,364	0,202	1,051	1,334	1,334
X_{18}	0,308	-1,419	-1,203	-0,447	0,308	0,956	1,496	1,496
X_{19}	-1,188	-1,272	-0,606	-0,024	0,559	1,058	1,474	1,474
X_{20}	-1,314	-1,159	-0,578	-0,011	0,529	1,034	1,499	1,499
*$X_1, X_3, X_4, X_5, X_6, X_8, X_9, X_{11}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}$ – stimulants, **X_2, X_7, X_{10}, X_{12} - destimulants								

According to the taxonomic analysis algorithm, the next step is to determine the distance c_{i0} from each i^{th} multidimensional point – a unit of the studied population to the point of the standard, the average value of the distance to the point of the standard, as well as the estimate of the standard deviation of this distance (formulae 9-12) and the results of calculations for the period 2013-2019 will be summarized in table 4.

Table 4 – Distances between individual observations and the vector-standard of the object under research

Indicator	2013 p.	2014 p.	2015 p.	2016 p.	2017 p.	2018 p.	2019 p.
c_{i0}	9,621	10,848	9,318	7,423	6,448	5,862	5,525
$\bar{c}_0$	7,864	7,864	7,864	7,864	7,864	7,864	7,864
σ_0	1,919	1,919	1,919	1,919	1,919	1,919	1,919
c_0	11,702	11,702	11,702	11,702	11,702	11,702	11,702

Observing the dynamics of changes in the distance between individual observations and the vector-standard c_{i0} in table 4, at this stage of calculations it is already possible to speak about improving the efficiency of asset formation and asset use of the research respondent, and therefore, the efficiency of asset management policies of the first strategic vector under growth strategy [9]. This statement is based on reducing the gap between the studied set of factors and their standard point. However, the calculation of the modified development ratio gives a more reliable estimate of the efficiency level of formation and use of fixed assets, tangible assets and cash assets of an agricultural company. The results of the calculation of direct and modified development ratio by formulae (13) and (14) of taxonomic analysis are presented in table 5 and figure 3.

Table 5 – Direct and modified development ratio of agricultural company (research respondent)

Indicator	2013 р.	2014 р.	2015 р.	2016 р.	2017 р.	2018 р.	2019 р.
d_i^*	0,822	0,927	0,796	0,634	0,551	0,501	0,472
d_i	0,178	0,073	0,204	0,366	0,449	0,499	0,528

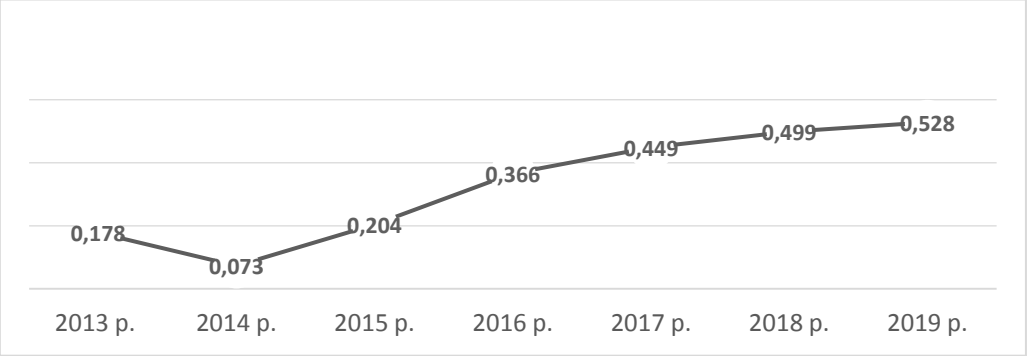

Figure 3 – Modified development ratio d_i of the research respondent 2013-2019

Based on the analysis of the change dynamics of the modified development ratio, the following assets are to be chosen for management to consolidate the growth trend: - intangible fixed assets breakthrough policy $П_{11}$; - tangible fixed assets progressive (proactive) policy $П_{21}$; - tangible assets rebirth policy $П_{31}$; - cash assets intensification policy $П_{41}$.

Conclusion. The method of dynamic programming is most adapted to discrete tasks, which in most cases are management and control tasks. It can be applied to any method of setting a target function and with any acceptable set of system states. The dynamic programming method can be used to describe and analyze dynamic management objects within the time for further identification and efficient management.

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АГРАРЛЫҚ КОМПАНИЯ АКТИВТЕРІН БАСҚАРУ ҮДЕРІСІНІҢ ДИНАМИКАЛЫҚ ҮЛГІСІ

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ДИНАМИЧЕСКОЕ МОДЕЛИРОВАНИЕ ПРОЦЕССА УПРАВЛЕНИЯ АКТИВАМИ АГРАРНЫХ КОМПАНИЙ

Аннотация. Цель. Описать возможности применения методического инструментария динамического моделирования для управления активами субъектов хозяйствования, в частности аграрных компаний.

Методы. В исследовании использован метод динамического программирования. Все классы задач динамического программирования решаются методом рекуррентных соотношений, которые составляются на основании принципа оптимальности. Также для построения программно-целевой модели управления активами аграрных компаний использованы методы стратегического моделирования и таксономического анализа.

Результаты. В статье предложено рассматривать управление активами аграрных компаний как целенаправленное систематическое влияние на факторы и условия, сопровождающие процессы отбора, комбинации и активации экономических ресурсов, их продуктивного использования в качестве активов субъекта хозяйствования для получения экономической выгоды, устойчивого развития и конкурентоспособности предприятия на целевом рынке. Следовательно, процесс управления активами предприятия U следует формализовать как множество $U = \{u_1, u_2, u_3, u_4\}$, которое может быть детализировано путем выделения влияния управления конкретным видом актива на величину модифицированного коэффициента развития предприятия d_i. А именно: u_1 (влияние управления нематериальными необоротными активами), u_2 (влияние управления материальными необоротными активами), u_3 (влияние управления материальными оборотными активами), u_4 (влияние управления денежными активами). Исходя из этого, обоснована программно-целевая модель управления активами аграрных компаний, которая включает стратегическую матрицу, комбинаторику управленческих решений, таксономический анализ и прогнозирование изменений с использованием стратегических альтернатив и предложенных политик управления отдельными видами активов. Приведен расчет изменений модифицированного коэффициента развития аграрной компании-респондента исследования (d_i) и предложен набор политик управления необоротными, оборотными и денежными активами респондента исследования в рамках идентифицированного стратегического вектора.

Выводы. Метод динамического программирования наиболее приспособлен к решению дискретных задач, которыми в большинстве являются задачи управления. В ходе исследования пришли к выводу, что его можно применять для описания и анализа динамических объектов управления во времени с целью эффективного управления. Поэтому предложили для аграрных компаний программно-целевую модель управления активами с использованием этого метода. Это дает возможность стратифицированного выбора политик управления активами аграрных компаний в рамках идентифицированного стратегического контура.

Ключевые слова: активы, динамическое моделирование, процессный подход, модель управления активами, комбинаторика управленческих решений, таксономический анализ, прогноз.

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EVALUATION OF INTEGRATED DEVELOPMENT OF THE ENTERPRISE

Abstract. The purpose of this article constitutes the formulation of a methodological approach to assessing and increasing the level of the integrated development effectiveness of Ukrainian light industry enterprises, taking into consideration the modularized diagnostics of their activity. **Methods.** The methodological toolkit for the effectiveness evaluation of integrated development of the enterprise is based on an integral indicator subject to the economic, organizational, informational and innovative integration modules. To undertake the study, 30 Ukrainian light industry enterprises were selected. The development diagnostics was carried out for each of them according to the key performance indicators and an integral indicator of the business development level was determined. **Results.** Seven groups of the enterprises were formed, and resulting from their integrated development, an increase in its level was received at all companies. The highest development growth was recorded at such companies as Orion, Kalyna, Lybid, Shovkova nytka and Lileya. These companies can significantly improve performance, through their development integration. A feature of the proposed orbital-based methodology is the stimulation of the development level increasing of both an individual enterprise and the industry as a whole, since less developed companies do not reduce the development level of others, but reach a higher level due to integration with the similar economic entities. **Conclusions.** The proposed orbital-based methodology implies the stimulation of the development level increasing of both an individual enterprise and the industry as a whole. It allows comprehensively to assess the enterprise`s performance by individual modules; to identify and compare the alternative development options; to determine deviations in the process of its functioning and to make adjustments to activities on time.

Key words: performance, integrated development, sustainable development, efficiency, business diagnostics.

Introduction. Modern dynamic economic conditions require the enhancement of approaches, methods, mechanisms, tools and development technologies for the domestic light industry companies with a view to increase their competitiveness. Features and advantages of the integrated development of the enterprise determine the complex and with a view to formulate a methodology appears, the practical implementation of which will provide an opportunity for quantitative evaluation of the efficiency level and allow to compare alternative options for the formation of an integrated development mechanism, specify deviations in such a process and adapt activities to changes in the environment of the enterprise`s operation. This study is intended to expand the methodological toolkit for assessing the development of the enterprise in the context of its integration in order to discover new opportunities and establish directions for the efficiency improving of the economy in modern economic conditions.

Nowadays, there are theoretical aspects and development of practical recommendations on the tools establishment for the analytical assessment of enterprise development, considering such essential structural elements as the enterprise development scale with the view to the level of educational and professional potential of the management system`s personnel and the level of enterprise development quality [1]. AP-processes for the formation of economic analysis in business activity do not provide an opportunity to assess the influence of menacing situations on the financial standing of enterprises to the full extend. Therefore, the taxonomic analysis techniques are applied, enabling introduction of the level of business development mathematically and identification of the most influential factors, including the consequences of negative events for the enterprise [2].

The traditional model of net present value has been replaced by a model for options evaluating using the global 100 index as a threshold value for the decision-making process evaluating in order to provide enterprises with a more complete assessment of the decision-making process [3]. Crowdfunding is considered in the capacity of an alternative financial source and an evaluation of the development of an enterprise [4]. The assessment of the relation between social entrepreneurship and sustainable business development is of significant importance [5]. This approach enables a high-quality evaluation of the development of the enterprise.

The chaos management model of the economic system has been developed in order to assess the effectiveness of the companies' development, allowing radically to change the status of the enterprise and the ability to influence supply and demand, and helps to strengthen the sustainability of the economic system [6].

An analysis of technological resources is used with a view to selecting the direction of micro-enterprise development in order to improve product quality [7]. Modern science contains studies of business development efficiency based on enterprise architecture (EA Architecture) and analysis of investments role, the main purpose of which is to provide the company with the opportunity to make decisions strategically about the future state of functioning and development on the whole [8,9]

The enterprise sustainable development model provides an assessment of the performance of convergence and/or synergy of numerous prospects for a purpose of development of a strategy for the integrated functioning of enterprises, rather than a narrow economic orientation of productivity [10]. Meanwhile, enterprises should pay significant attention to assessing and maintaining a sufficient level of competitiveness [11,12] and intellectual development [13].

The process of improving the enterprise's portfolio planning is assessed by means of comprehensive diagnostics of business development using the following five most important indicators: opportunities, accessibility, feasibility, adaptability and continuity [14]. Diagnostics of enterprise development focuses on the relative influence of two critical factors on assessing the quality of relationships in standard distribution channels, namely on the perceived quality of service of an integrator partner and the degree of affective and cognitive credibility given to this partner [15]. Integrated innovative management of enterprise development can significantly decrease the risk level in the process and promote the successful formation of an innovative business model [16].

The main disadvantage of models for assessing the business development level is their short-term features. Nowadays, a system for assessing financial condition has been formed based on a system of actual indicators. To that end, the "Octant sustainable enterprise development" tool for indicator forecasting was created in order to develop recommendations for management decision-making. The predicted algorithm for assessing the sustainability of the industrial enterprises development lies in its core [17].

An assessment of a company's development level can be based on a Product Sustainability Index (ProdSI) and a Process Sustainability Index (ProcSI), in order to form a platform for the integration evaluation of production at the system level [18].

The method of identifying the ideal point of an unclear group and combined weighting with an advanced method of the ratio of group order and entropy weight is also used in the assessing process of the sustainable development of enterprises [19].

Assessment of a company development is carried out for a purpose of improvement of four abilities in the following four aspects: the ability to comprehend the environment, the ability to estimate the situation, the ability to make strategic decisions and organizational adaptability [20].

In the process of evaluation of the enterprise development, the E-SET tool is implemented with a view to achievement of the sustainable business strategy, developed using indicators from six global sustainable development reporting structures and their implementation through programming [21].

Thus, the multidimensionality of methodological approaches to assessing the development of the enterprise enables distinguishing the following major areas:

first of all, the compulsory formation of an indicators system depending on the features of the business and the sectors of its functioning;

secondly, the use and implementation of information and telecommunication technologies in evaluating and presenting results;

thirdly, the implementation of different indicators in an integral indicator of the company's development effectiveness;

fourthly, focus on development diagnostics taking into consideration the interests of all business stakeholders;

fifthly, the establishment of methodological toolkit for forecasting the level of enterprise development.

Despite the significant scientific potential for business development evaluation, many aspects concerning this direction of research remain insufficiently covered. This concerns the issues of assessing the effectiveness of integrated enterprise development and making effective management decisions on its basis.The key motivation for the implementation of this study, in order to fill this science gap, is the need to develop a methodological approach to determine alternatives for company integration and assess enterprise development with a view to breakthrough increase of the level of performance and competitiveness.

All this contributed to the establishment of the targets of this article, which lies in the formation of a methodological approach to evaluating and increasing the level of effectiveness of the integrated development of the Ukrainian light industry enterprises, taking into consideration the modularized performance diagnostics.

Materials and methods of research. The procedure and methodological toolkit for assessing the effectiveness of integrated development of an enterprise are based on an integral indicator, considering the constituent integration modules according to the formula (1):

$$Ef_{id} = \alpha \cdot Ef_{eco} + \beta \cdot Ef_{org} + \gamma \cdot Ef_{inf} + \delta \cdot Ef_{inn} \quad (1)$$

where Ef_{id} is the effectiveness of the integrated development of the enterprise; Ef_{eco}, Ef_{org}, Ef_{inf}□, Ef_{inn} is the development efficiency in accordance with the economic, organizational, informational and innovative integrated module; α, β, γ, δ are the corresponding weighting coefficients of the relative indicators importance Ef_{eco}, Ef_{org}, Ef_{inf}□, Ef_{inn}.

The integrated development assessment is based on indicators of the functioning performance of organizational, economic, informational and innovative integrated modules, the influence of which is determined through weighting factors (α, β, γ, δ). Their relative value is determined through the hierarchy analysis method [22]. The essence of this method consists in the hierarchical decomposition of the problem and the current rating score with alternative solutions.

The formation of an array of indicators characterizing the development performance of the economic, organizational, informational and innovative integrated module is expressed with the help of an integrated assessment considering the total number of individual indicators, indicating the level of development effectiveness in individual directions.

For the research, 30 Ukrainian enterprises of light industry, which represent its various sub-sectors from different regions, were selected: “Gloria”, “Voronin”, “Rosa” (Kyiv), “Lesia”, “Arsaniya” (Zhytomyr Region), “Strichka”, “Ovetri” (Dnipropetrovsk region), “Lileya”, “Volodarka” (Vinnitsa Region), “Edelvika” (Volyn region), “Goryn” (Khmelnytsky Region), "Khutrofirma" Tysmenytsia "(Ivano- Frankivsk region), “Kalyna”, “Trottola” (Lviv region), “Rivne factory of nonwoven materials”, “Rivne-Styl” (Rivne region), “Modessa” (Odessa region), “Santa Ukraine” (Mykolaiv region) , "Ternopilske obiednannia" Teksterno "(Ternopil region)," Cherkasy silk mill ”(Cherkasy region)," Orion "," Fabryka Prut "(Chernivtsi region)," Bereginia ”," Desna "," Lybid "(Chernihiv region) , “Loteks”, “Svit” (Poltava region), “Zoryanka”, “Sabina“ (Kirovograd region), and “Shovkova nytka” (Zaporizhzhya region). Development diagnostics was carried out for each of them according to key performance indicators as of 2019 for the economic, organizational, innovative and information module.

Research results. The methodology for evaluating the effectiveness of the functioning of the integrated development mechanism of an enterprise should be implemented in stages. First of all, it is necessary to determine performance indicators, with the help of which it is possible to diagnose integrated development for each module, and then calculate the integral indicator. This approach to evaluation allows to highlight the impact of a particular module on the effectiveness of the company`s integrated development. Meanwhile, the effectiveness of the economic, organizational, innovative and information modules is determined bearing in mind the characteristics of individual indicators.

The principles and tools of internal and intercompany integration should be organically combined, when forming a system of indicators for an enterprise development. The activity of an integrated enterprise is ensured by the planning, organization, motivation and control mechanisms, therefore, the

proposed methodological approach is a set of interaction methods of internal elements and subsystems, ensuring optimal coordination of integration processes at different stages of company development by means of synchronizing internal business processes and their coherent behaviour, determining the optimal managerial impact according to the stage of life cycle of an enterprise, activation and implementation of integration processes.

Based on the diagnostics of the company's performance considering the economic, organizational, innovative and information modules, the integrated indicators of the enterprise development effectiveness are determined (table).

The results of business diagnostics of the development level of the Ukrainian light industry enterprises

№	The name of organisation	Economic module	Organizational module	Information module	Innovative module	Ef_{id}
1	Arsania	4,537	2,328	1,624	1,983	2,912
2	Bereginia	4,429	3,863	4,973	5,843	4,756
3	Cherkasy silk mill	1,962	1,375	2,285	3,533	2,301
4	Desna	7,658	9,982	4,722	6,732	7,605
5	Edelvika	9,874	8,792	7,638	6,721	8,441
6	Fabryka Prut	8,962	7,485	5,862	4,938	7,079
7	Gloria	9,554	8,995	8,638	6,995	8,581
8	Goryn	4,138	3,788	4,673	5,801	4,587
9	Kalyna	2,942	1,976	0,794	0,953	1,877
10	Lesia	2,564	1,962	3,175	1,452	2,178
11	Lileya	5,521	7,766	3,728	3,249	5,210
12	Loteks	5,164	8,562	3,843	3,345	5,323
13	Lybid	3,287	4,762	2,449	2,085	3,207
14	Modessa	6,822	4,895	7,852	2,891	5,367
15	Orion	1,485	2,123	1,328	1,432	1,608
16	Ovetri	9,201	9,548	7,942	5,454	8,074
17	Rivne FoNM	7,408	4,117	7,459	4,130	5,680
18	Rivne-Styl	8,847	7,192	5,938	5,745	7,204
19	Rosa	6,182	6,782	6,743	7,257	6,702
20	Sabina	4,456	2,977	0,826	1,174	2,717
21	Santa Ukraine	6,439	8,983	3,829	1,248	5,277
22	Shovkova nytka	5,881	3,162	0,982	0,607	3,117
23	Strichka	8,642	6,257	4,48	2,572	5,827
24	Svit	8,628	9,245	6,911	5,556	7,701
25	Teksterno	2,876	4,752	2,128	1,256	2,788
26	Trottola	6,984	7,391	6,612	3,646	6,097
27	Tysmenytsia	8,955	8,437	5,594	3,642	6,913
28	Volodarka	2,128	5,082	0,992	0,658	2,299
29	Voronin	8,429	7,435	8,864	6,828	7,787
30	Zoryanka	2,176	1,745	3,523	0,651	1,807

Source: formed by the authors

The orbital of integrated enterprise development is proposed to be form (figure 1). The orbital of the company is determined on the basis of the integral indicator value obtained on a scale from 0 to 10, and the segment of the enterprise's location is highlighted according to the most developed company`s module

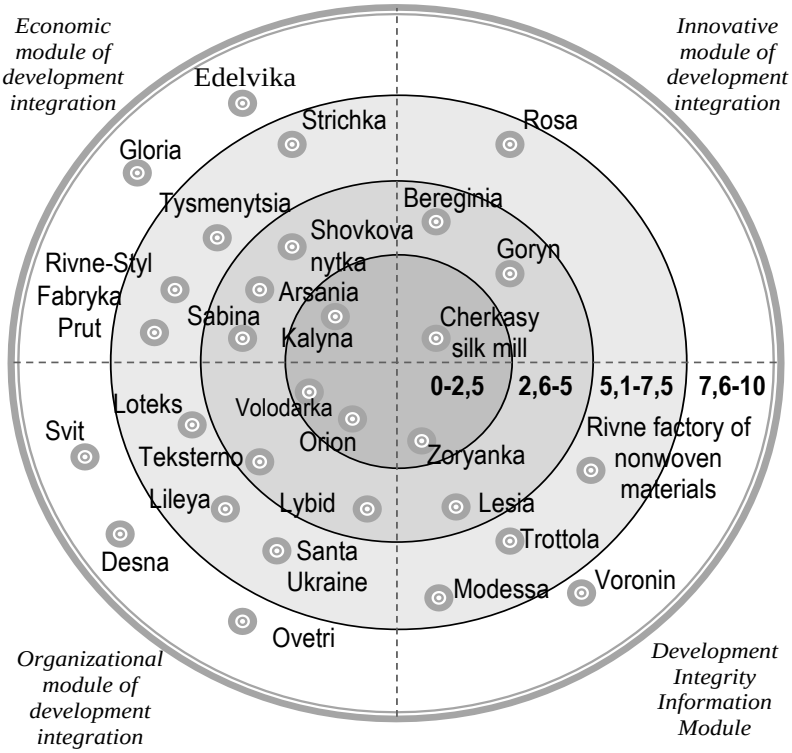

Figure 1 – Orbital of integrated development of the Ukrainian light industry enterprises.
Source: formed by the authors

according to the results of the diagnosis conducted. This enables the determination of the fact, which enterprises are the most developed and in which sphere they have an advantage.

Taking into account the strategic intentions of the business based on the proposed orbit, it is possible to determine the opportunities and directions of the companies' mutual integration. Enterprises with a single orbit can increase their development efficiency by means of mutual integration based on the most advanced modules and reach a higher orbit level, gaining business development growth.

Due account being taken of the current orbit of the development of light industry in Ukraine, it is proposed to create the following integrated groups of enterprises:

1) Kalyna, Volodarka, Orion, Zoryanka, Cherkasy silk mill;
2) Shovkova nytka, Goryn, Lybid, Sabina, Lesya;
3) Arsania, Tekstemo, Bereginia;
4) Tysmenytsia, Trotolla, Santa Ukraine, Loteks;
5) Rivne nonwoven materials factory, Rivne-Styl, Lileya;
6) Fabryka Prut, Strichka, Rosa, Modessa;
7) Gloria, Voronin, Right, Overty, Sweet, Edelvika.

These companies can significantly increase their operations performance by integrating between themselves. The feature of the proposed orbit is to stimulate the development growth of both the individual enterprise and the industry as a whole, since less developed companies in the process of integration do not decrease the level of development of others, but reach a higher level due to integration with the similar economic entities. If to integrate them with the proposed distribution by groups and determine the integral development index for each enterprise, taking into account the proposed modules, then eventually an increase in its level at all companies can be noted (figure 2).

At the same time, various combinations of integrated development between enterprises can be considered and the most effective option among alternative ones can be determined. The highest development growth can be traced in such enterprises as Orion (+3.1), Kalyna (+2.7), Lybid (+2.7), Shovkova nytka (+2.6) and Lileya (+2.6) In this case, a significant role has been played by economic and organizational development module, as well as the innovative and informational directions of companies, combined with the ability to be flexible and adaptive compared to large companies.

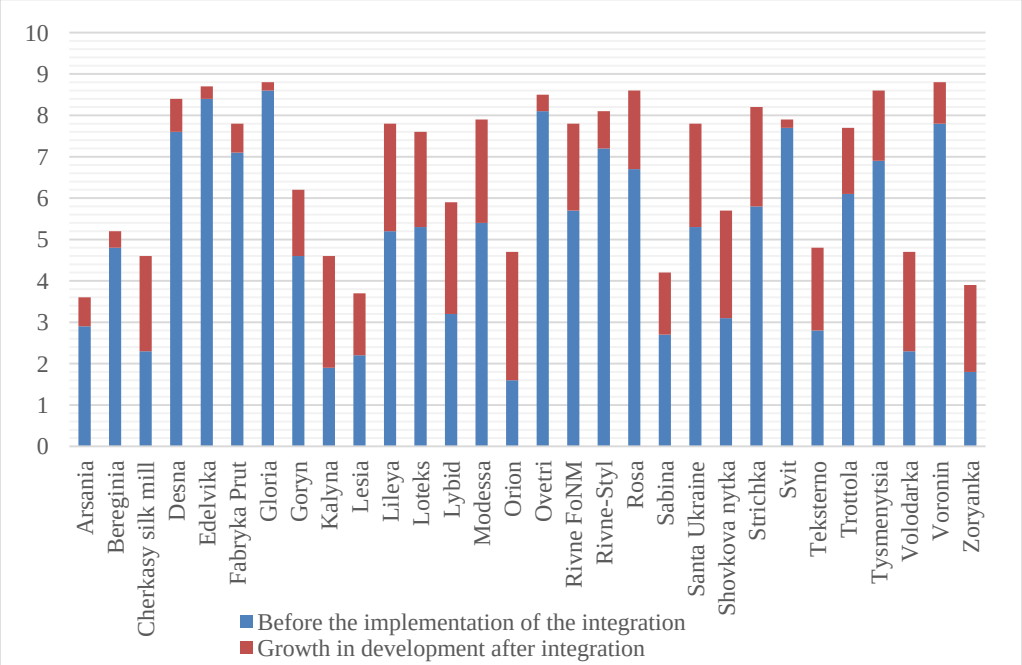

Figure 2 – The level of performance growth of light industry enterprises as a result of integrated development. Source: formed by the authors

The advantage of the proposed methodology is also the possibility to transform the system of indicators for diagnosing the development level of the enterprise using particular modules. This provides the possibility to use it not only in light industry companies, but also in other industries. Meanwhile, a unique set of key performance indicators can be formed taking into account the business goals of all stakeholders.

A promising direction for improving the proposed methodology is the practical opportunity to identify the most dangerous (in terms of influence on the level of development indicators) risks for the enterprise resulting from their integration. Bearing in mind the correction factors, formed due to the existing strengths and weaknesses of the enterprise, it enables determination of those internal factors of the enterprise, the development or elimination of which will minimize the existing risks.

The methodology for assessing integrated development on the basis of the orbital formation allows comprehensively to assess the performance of the enterprise using individual modules, compare alternative development options, identify deviations in the process of its functioning, make adjustments and modifications to activity on time.

Conclusion. Assessment of the integrated development of the enterprise provides for the formation of a performance indicators system with the help of which it is possible to conduct business diagnostics using the economic, organizational, innovative and information module, and then calculate the integral indicator. This approach to evaluation allows to highlight the impact of a particular module on the performance of the company`s integrated development.

The orbital of integrated development of enterprises is proposed to be formed on the basis of the obtained integral indicator for each enterprise. Meanwhile, the enterprise location segment is determined taking into consideration the most developed module. This enables the identification of the most developed companies and their predominant development direction.

Based on the developed orbital of development of the light industry enterprises in Ukraine, seven integrated groups of enterprises were formed. As a result of the integration of companies according to the proposed groups, an integrated development indicator was determined for each enterprise, taking into account the modules, and an increase in its level was obtained at all companies. The highest development growth was recorded at such enterprises as Orion (+3.1), Kalyna (+2.7), Lybid (+2.7), Shovkova nytka (+2.6) and Lileya (+2.6).

By integrating their development, these companies can significantly improve their performance. A feature of the proposed orbital-based methodology is the stimulation of the development level increasing of both an individual enterprise and the industry as a whole, since less developed companies do not reduce the development level of others, but reach a higher level due to integration with the similar economic entities.

The proposed methodological approach to assessment based on the formation of the integrated development orbital allows comprehensively to evaluate the performance of the enterprise's operation using separate modules, identify and compare alternative development options, identify deviations in the process of its functioning, and make adjustments and modifications to activity on time.

A promising direction for improving this methodology is the practical possibility of determining integration risks for the enterprise, developing software for diagnostics, and forming a mechanism for identifying the most optimal integration option for a group of companies.

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КӘСІПОРЫННЫҢ КЕШЕНДІ ДАМУЫН БАҒАЛАУ

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ОЦЕНИВАНИЕ ИНТЕГРИРОВАННОГО РАЗВИТИЯ ПРЕДПРИЯТИЯ

Аннотация. Целью данной статьи является формирование методического подхода к оценке и повышению уровня результативности интегрированного развития предприятий легкой промышленности Украины с учетом модулеризированной диагностики их деятельности.

Методы. Методический инструментарий оценки эффективности интегрированного развития предприятия основан на интегральном показателе с учетом экономического, организационного, информационного и инновационного модулей интегрированности. Для проведения исследования выбрано 30 предприятий легкой промышленности Украины. Для каждого из них проведена диагностика развития по ключевым индикаторам эффективности деятельности и определен интегральный показатель уровня развития бизнеса.

Результаты. Сформировано семь групп предприятий, в результате интегрированности развития которых получено повышение его уровня на всех компаниях. Интегрируясь между собой, данные компании могут существенно повысить эффективность деятельности. Особенностью предлагаемой орбитали является стимулирование повышения уровня развития как отдельного предприятия, так и отрасли в целом, так как менее развитые компании в процессе интегрированности не уменьшают уровень развития других, а выходят на более высокий уровень за счет интегрированности с подобными субъектами хозяйствования. Если интегрировать их с предложенным распределением по группам и определить интегральный показатель развития по каждому предприятию с учетом предложенных модулей, то в конечном результате можно отметить повышение его уровня на всех компаниях.

Самый высокий рост развития зафиксирован в таких компаниях, как Orion, Kalyna, Lybid, Shovkovanytka и Lileya.Интегрируя свое развитие, данные компании могут существенно повысить эффективность деятельности. Особенностью предлагаемой методики на основе орбитали является стимулирование повышения уровня развития как отдельного предприятия, так и отрасли в целом, поскольку менее развитые компании не уменьшают уровень развития других, а выходят на более высокий уровень за счет интегрированности с подобными субъектами хозяйствования.

Преимуществом предложенной методики является также возможность трансформации системы индикаторов для проведения диагностики уровня развития предприятия за определенными модулями. Это предоставляет возможность ее использования не только в компаниях легкой промышленности, но и в других

отраслях. При этом можно сформировать уникальный набор ключевых показателей эффективности деятельности с учетом целей бизнеса и всех заинтересованных сторон.

Выводы. Предлагаемая методика на основе формирования орбитали предполагает стимулирование повышения уровня развития как отдельного предприятия, так и отрасли в целом. Она позволяет комплексно оценить эффективность функционирования предприятия по отдельным модулям, идентифицировать и сравнить альтернативные варианты развития, выявить отклонения в процессе его функционирования и своевременно вносить изменения в деятельность.

Ключевые слова: результативность, интегрированное развитие, устойчивое развитие, эффективность, бизнес-диагностика.

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TRENDS FOR UKRAINE'S CURRENCY MARKET DEVELOPMENT

Abstract. At the current stage of the country's economic development, its foreign exchange market is determined by the complicated economic relations associated with foreign currency buying and selling for servicing transactions in the sphere of trade and business. Growing openness of the national economy and Ukraine's integration into the world economic system are among the reasons for the increased influence of external and internal factors in the foreign exchange market, increased volatility of the national currency exchange rate and pose high risk on the transactions in the foreign exchange market. This, in turn, diminishes the attractiveness of the economy for doing business. Combining the national economy with the world market through the mechanism of monetary relations, the exchange rate of the national currency is tightly linked to all economic processes. On the one hand, it is affected by a complex set of endogenous and exogenous macroeconomic factors; on the other hand, it affects the country's financial situation. National currency depends on the competitiveness of domestic production in international markets, volume and direction of foreign economic relations, and cash flows. In this context, the hryvnia exchange rate is seen as an important indicator of the country's economic development, an effective monetary policy instrument of the Central Bank, and a key characteristic of the currency market. A strong need to improve the efficiency of the currency market in Ukraine encouraged the choice of the research topic.

The purpose of the study is to determine the peculiarities of the situation on the national currency market and outline the trends for changes of the main indicators of its activity. Particular attention is paid to the analysis of tendencies of the hryvnia exchange rate fluctuation against the US dollar and euro, as well as the factors that cause volatility of the Ukrainian currency market.

The study identifies the peculiarities of Ukraine's currency market during 2015-2019. Based on the analysis of the dynamics of the hryvnia exchange rate, the main stages of the exchange rate change have been pointed out and the determining factors of the change of the hryvnia exchange rate against the US dollar and euro have been highlighted at each stage. The situation on the national currency market and the main indicators, which testify to the effectiveness of its functioning, have been evaluated. The dynamics of Ukraine's foreign exchange reserves, currency interventions of the National Bank of Ukraine and gross external debt have been investigated. Methods of correlation analysis have been used to identify exchange rate factors. Synchronization of dynamics of individual macroeconomic indicators and hryvnia exchange rates against the US dollar and euro during the period of 2015 and 11 months of 2019 has been explored. According to the data obtained, assumptions about the future trends of the national currency market have been made.

Key words: currency market, foreign exchange market, exchange rate, interventions, exchange rate policy, international reserves, the National Bank of Ukraine.

Introduction. The problems of changing the powers of certain control and regulation bodies in the financial market are extremely relevant in the context of modern globalization processes and the manifestations of crisis phenomena. [1] The current stage of the world economy development is characterized by a high level of internationalization and globalization, which in turn creates prerequisites for a significant impact of both endogenous and exogenous factors on the national economy and the national currency market. Particularly striking is the impact in times of crisis in the economy: it is at this stage of development that the exchange rate sharply responds to the manifestation of instability in any sector of the national economy and the economy of countries - trading partners.

Under the conditions of market transformations and growing influence of the world economy on the currency market of Ukraine, the importance of the hryvnia exchange rate as an indicator of the economic development of the country, an effective instrument of the monetary policy implementation by the Central Bank and a key characteristic of the state of the currency market is increasing. To achieve economic and financial stabilization, first of all, it is necessary, to ensure stability of the national currency. This task is entrusted to the Central Bank, its role in the foreign exchange market is crucial. The necessity of a long-term monetary policy of monetary authorities as a stabilizing factor is emphasized in the research by O.I.Bereslavskaya. [2, p.9]. According to the author, this will allow Ukraine's currency market to react to the changes in the external environment less painfully.

In today's global environment, the emerging markets are considered to be the most sensitive to endogenous and exogenous factors. This is because, on the one hand, they are becoming more open to the world currency market and, at the same time, do not have an effective mechanism to mitigate the negative impact of factors. Scientists O.V.Dzublyuk and O.M.Vladimir note that "in the conditions of comprehensive globalization and internationalization of social and reproductive processes, the development of economic ties is impossible without the functioning of a well-established system of monetary relations, which is one of the main factors of market transformation of the economy" [3, p.9]. That is why it is necessary to constantly monitor the currency market and analyze the dynamics of its indicators to prevent crises in the currency market.

Methods. The methodological basis of the study includes general research methods of economic science. Statistical and graphical analysis methods have been used for empirical studies of the currency market of Ukraine. In addition, general research methods such as generalization and comparison have also been used. The information base consists of the official materials of the State Statistics Service of Ukraine, analytical information of the National Bank of Ukraine, as well as publications of scholars on currency market functioning.

Analysis of recent researches and publications. Such scientists as O. Bereslavska, F. Zhuravka, O. Dzublyuk, O. Vladimir, N. Zhmurko and others have devoted their research to the theoretical and practical aspects of currency market functioning. Despite the considerable amount of research concerning the problems of foreign exchange market functioning, the issue of establishing instruments for ensuring the stability of currency market in Ukraine remains unresolved.

Statement of the problem. The purpose of the study is to determine the peculiarities of the situation on the national currency market and outline the trends for changes of the main indicators of its activity. Particular attention is paid to the analysis of tendencies of the hryvnia exchange rate fluctuation against the US dollar and euro, as well as the factors that cause volatility of the Ukrainian currency market.

Main results of the study. The modern currency market is a collection of subordinated, interrelated system of market segments of international, regional and national economies, institutional environment of economic relations related to conducting foreign exchange transactions, use of currency values and currency derivatives [4, p. 41]. The processes occurring in the national currency market are shaped by many economic external and internal factors. Today, there is a steady tendency to increase international capital flows, which is explained by the increase in the international exchange of goods, services and capital, joint entrepreneurship and scientific and technical cooperation, the development of world tourism. Under such circumstances, interest in the formation of the exchange rate and its dynamics increases. Therefore, the exchange rate can be considered to be an indicator that reflects the state of the country's economy.

One of the main tasks of the National Bank of Ukraine in regulating the foreign exchange market is to establish the equilibrium exchange rate of the hryvnia. There are different definitions of the equilibrium. The equilibrium exchange rate is sometimes defined as the rate set on the foreign exchange market under the influence of supply and demand without government intervention. Another approach to defining a fundamental equilibrium is the one that establishes external and internal equilibria in the country. Internal equilibrium can be achieved if there is full employment and low inflation in the country, a constant level of balance of the capital movement account is needed to achieve external equilibrium.

Any country is interested in the stability of its national currency, aiming for its gradual strengthening. National economic policy bodies rely on the stability of the national currency. To do it, you need to constantly monitor the dynamics of the currency exchange rate in relation to the macroeconomic indicators, which are fundamental factors of exchange rate formation.

In the first stage of the national currency market study, the dynamics of the hryvnia average exchange rate of against the US dollar and euro in foreign currency cash transactions from January 2016 to November 2019 has been analyzed (figure 1).

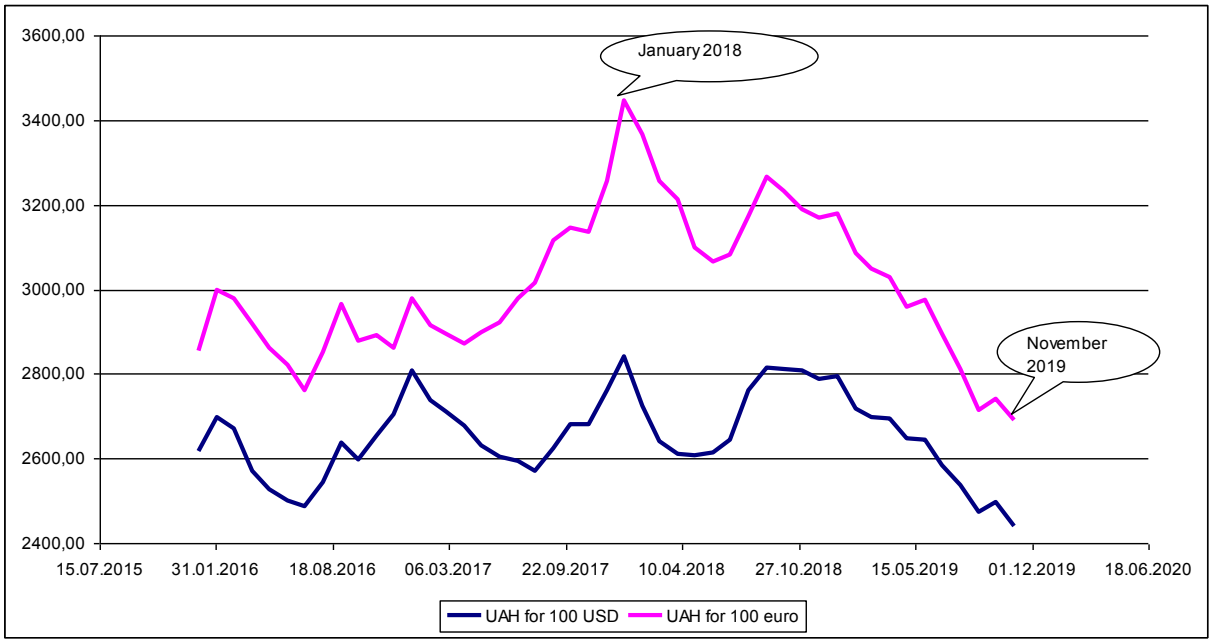

Figure 1 – Dynamics of the hryvnia exchange rate against the US dollar and the euro during January 2016 - November 2019 [5]

Graphical analysis of the dynamics of the hryvnia exchange rate against the US dollar in recent years (see figure 1) makes it possible to identify separate periods characterized by different rates of change in exchange rate fluctuations.

The first period is from January 2016 to January 2017. During this period, the hryvnia has lost 7.2% of its value against the US dollar and 4.3% against the euro. At this stage, the relative stability of the hryvnia exchange rate is maintained through interventions mainly in the form of currency auctions. The prudent monetary intervention policy allowed to reduce the average monthly volatility of the hryvnia exchange rate against the US dollar from 28.8% in 2015 to 6.2% in 2016 and to continue the further movement towards a liberal model of currency regulation. At the same time, international reserves managed to increase by 16.8% or by USD 2.2 billion. At the end of 2016, they totaled $ 15.5 billion. Net purchases of currency by the National Bank through foreign exchange interventions in the interbank market totaled $ 1.6 billion.

The main sources of replenishment of international reserves in 2016 were net purchases by the National Bank of $ 1.3 billion during the foreign exchange interventions against the backdrop of the favorable situation on the foreign exchange market, as well as the receipt of financing from the International Monetary Fund worth about $ 1 billion. [6].

This period was also characterized by “monetary targeting” and floating exchange rate, the main condition of which was to stabilize the financial system [7, p.151].

The second period, from January 2017 to January 2018, is characterized by a consistent depreciation of the national currency compared to the previous period. During 2017, exchange rate fluctuations were observed, but the hryvnia devalued by only 3.2% against the US dollar. The hryvnia devaluation against the euro was more significant, i.e. the hryvnia lost 12%. The main reasons were the cost of servicing the external debt and the negative foreign trade balance. At the end of 2017, foreign exchange reserves amounted to $ 18.81 billion and increased by 21.8% during the year. Typical for this period is the introduction of “inflation targeting” and a floating exchange rate to ensure economic growth.

In general, the depreciation of the national currency is common for the first and second periods. The main devaluation factors were a decrease in foreign exchange earnings and, as a consequence, a shortage of currency in the foreign exchange market and an increase in the cost of servicing public debt.

Overall, the hryvnia exchange rate during 2016-2017 depreciated by 10.44% against the US dollar and by 16.3% against the euro. It is worth noting that the graphical analysis of figure 1 generally confirms the synchronicity of changes in UAH / USD and UAH / EUR exchange rates.

The third period is from February 2018 to November 2019. At this stage, a new trend has begun: the dynamics of the hryvnia exchange rate against the US dollar is marked by the gradual strengthening of the national currency. Thus, the hryvnia went up by 14.2% against the US dollar, and by 22.0%against the euro. According to the National Bank of Ukraine, in 2018 the volatility of the hryvnia exchange rate decreased and was in the range of 2 – 10%. Exchange rate policy at this time is characterized by measures aimed at improving the market and transparency of the hryvnia exchange rate. For this purpose, priority was given to the forms of interventions, for which the National Bank does not offer, but accepts the price offered by the other participants of the foreign exchange market.

The development of the foreign exchange market was facilitated, in particular, by the abolition of a number of foreign exchange restrictions and the gradual habituation of all market participants to operate under floating exchange rate conditions. Net currency purchases in 2018 amounted to nearly $ 1.4 billion. As of 2018, the population has sold to banks $ 1.5 billion more than bought. This allowed the National Bank of Ukraine to buy currency into reserves without affecting the direction of the hryvnia exchange rate, which in 2018 strengthened by 1.4%. The trend of strengthening the hryvnia exchange rate in 2019 continued.

Private money transfers to Ukraine play a significant role in the national currency market. Taking into account the fact that some Ukrainians are abroad and receive wages outside our country, these remittances can also be considered to be a part of investment income to Ukraine. In recent years, there has been an increase in the volume of private money transfers to Ukraine [8, p. 9]. As a result of 2018, 47% of private money transfers to Ukraine came through informal sources, the rest through correspondent bank accounts and international payment systems. Total revenue over 2015-2018 increased by 51.66% from $ 1,868 million to $ 2833 million. The trend of increasing private transfers in 2019 acted as a revaluation factor of the hryvnia.

To evaluate the situation on the national currency market, its main characteristics are worth considering. They include foreign exchange reserves; foreign exchange interventions and gross external debt (see table 1).

Table 1 – International Reserves and Dynamics of the National Bank of Ukraine Interventions in 2016-2019

Indicator	2016	2017	2018	2019 (11 months)
Intervention balance of the National Bank of Ukraine, billion USD	1,6	1,3	1,4	5,9
International Reserves of the National Bank of Ukraine, billion USD	15,5	18,8	20,8	21,9
Gross external debt, million USD	45604,6	48989,4	50462,5	48651,5
Gross external debt change rates, %	5,0	7,4	3,0	-3,6

During 2016 – 2019 (11 months), the balance of foreign exchange interventions was positive. The National Bank of Ukraine continues to buy surpluses in the foreign exchange market. The surplus supply of foreign currency in the foreign exchange market results in an increase in the international reserves of the National Bank of Ukraine and a revaluation of the hryvnia. It should be noted that the National Bank of Ukraine does not counter the fundamental trends in the foreign exchange market, which are due to market factors. That is, currency interventions do not change the direction of the exchange rate, but affect only the amplitude and speed of its change [9, p.7].

Along with the positive balance of the National Bank of Ukraine interventions, there is an increase in the volume of international reserves: during 2016 – 2019 (11 months) the growth was 41.3%. The increase in the volume of gold and foreign exchange reserves was partly influenced by the fact that the volume of currency sales to the population on the cash market exceeds the volume of purchases. Thus, during 2016 – 11 months of 2019, the amount of foreign currency purchased from the population exceeded the volume of foreign currency purchase by 20.6%.

To identify exchange rate factors, we analyze the relationship between the dynamics of individual macroeconomic indicators and the hryvnia exchange rates for 2015 – 2019 (Y_1 stands for UAH / USD, Y_2 stands for UAH / EUR) using monthly correlation methods. Fundamental factors are represented by the following macroeconomic indicators: x_1 stands for the balance of exports and imports of goods and services, USD million; x_2– money supply (M3 unit), UAH million; x_3– currency sales in the interbank foreign exchange market, USD million in equivalent; x_4– purchase of foreign currency in cash, USD million in equivalent; x_5– budget deficit,% of GDP; x_6– external debt (direct and guaranteed), billion USD; x_7– gold and foreign exchange reserves of the National Bank of Ukraine, million USD; x_8– consumer price index, %.

The correlation between these factors and the hryvnia exchange rates is presented in the correlation matrix (table 2).

Table 2 – Correlation between fundamental factors and exchange rates

	Y_1	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	Y_2
Y_1	1	0,21	0,69	-0,21	0,37	-0,05	0,61	0,61	-0,12	0,89
x_1		1	-0,26	-0,47	-0,52	-0,19	0,31	0,04	0,25	0,37
x_2			1	0,04	0,90	-0,05	0,71	0,79	0,49	-0,18
x_3				1	0,39	-0,14	0,14	0,20	-0,10	-0,22
x_4					1	0,23	0,77	0,85	-0,30	0,46
x_5						1	0,19	0,08	-0,02	0,01
x_6							1	0,94	-0,39	0,63
x_7								1	-0,43	0,60
x_8									1	-0,15
Y_2										1
Source: calculated according to the National Bank of Ukraine										

Non-diagonal elements of a matrix are linear correlation coefficient of r_{ik} that evaluate not the causal effect but the correlation between the correlating indicators. Since the information base of this study is presented in a dynamic series, the correlation coefficients reflect the synchrony of changes in fundamental factors and exchange rates, which is caused by the action of common reasons for their variation. The critical value of the correlation indicator with a probability of 0.95 is $r_{1\text{-}0,05}(59) = 0,26$.

The exchange rates of UAH / USD and UAH / EUR change in dynamics almost synchronously – the correlation coefficient between them is 0.89. Common to both exchange rates is the materiality of such a factor as external debt (direct and guaranteed) and the foreign exchange reserves of the National Bank of Ukraine. The insignificance of the link is revealed by the amount of currency sales in the interbank foreign exchange market, USD million in equivalent and consolidated budget deficit, % of GDP. With other fundamental factors, the coupling density of each pair of exchange ratios differs. As correlation coefficients indicate, the correlation between the UAH / EUR exchange rate and the fundamental factors is stronger than the UAH / USD exchange rate. For the UAH / EUR and for the UAH / USD, the correlation coefficients with all fundamental factors selected for the study do not exceed 0.7.

The determining factor for setting the price for a currency is the demand and supply for it in the foreign exchange market. To analyze the tendency of development of the cash foreign exchange market we have shown the dynamics of the volume of cash foreign exchange transactions during 2016 – 2019 (11 months) and their trend values in figure 2.

The graphical analysis reveals a general tendency to increase the volume of foreign currency purchases and sales in the cash market, the bulk of which are US dollars (75.6% of the total cash currency purchases and sales in the market in 2019). Trend values can be regarded as the equilibrium values of currency sales and purchases.

Cash foreign currency sales exceeded the equilibrium level in July – December 2017, July – September 2018 and July – November 2019, indicating the seasonality of this phenomenon. The slowdown in the growth rate of foreign currency sales and purchases in the foreign exchange cash market in 2018 – 2019 indicates the stabilization of the foreign exchange market.

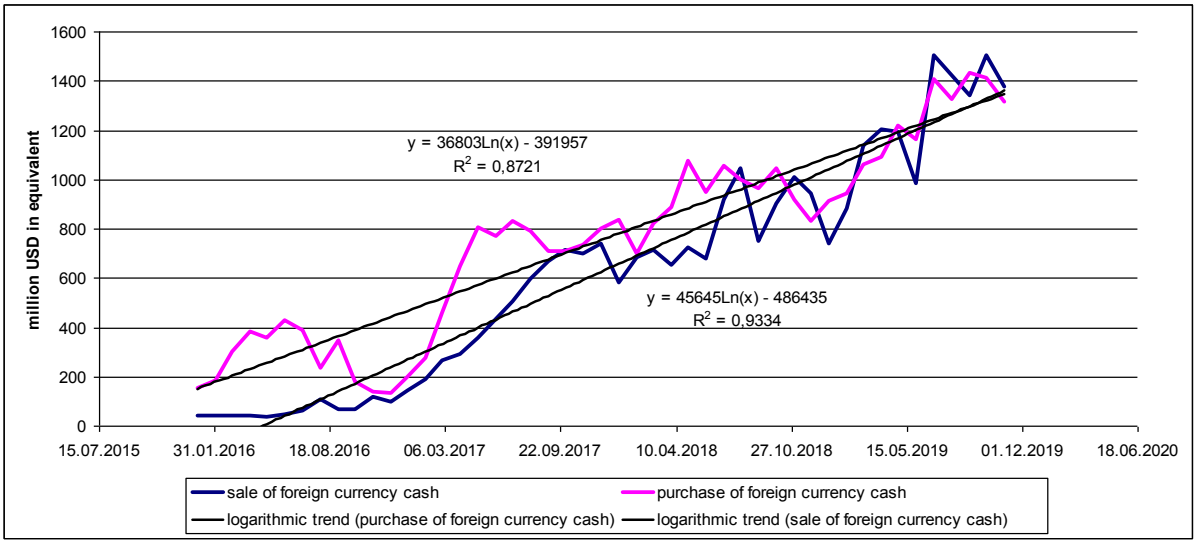

Figure 2 – Volume of cash foreign currency transactions during 2016 – 2019 and its trend values

The rapid growth in the volume of cash foreign currency transactions is explained by the fact that effective stabilization measures have been taken as a prerequisite for stabilization of the foreign exchange market with the aggravation of the financial and political crisis in Ukraine. Therefore, since 2015, a significant restriction on the sale of cash in foreign currency to the population of the country has been introduced. This situation continued until the end of 2016. And, since 2017, this restriction has been mitigating, and other transactions related to foreign currency have become much simpler [6, p. 158].

Trend models in Fig. 2 of the volumes of sale of cash foreign currency and volumes of its purchase indicate a further increase of total volume of transactions with foreign currencies on the cash foreign exchange market.

Conclusion. The analysis of the dynamics of the national currency exchange rate and the determinants of its formation allows us to confirm that the devaluation of the hryvnia during 2016 – 2017 is the result of the accumulated imbalances in the country's economy. During 2018 – 2019, the trend for national currency appreciation is explained by the predominance of foreign currency purchases from the population over its population sales, as well as the growth of the country's external debt due to borrowing. Currency interventions are used as a means of reducing the amplitude of price fluctuations and are not the cause of inflation. This is evidenced by the insignificance of the connection between them. The study found that the hryvnia exchange rate against the US dollar and euro fluctuates in synchrony with such macroeconomic factors as external debt (direct and guaranteed) and the foreign exchange reserves of the national Bank of Ukraine.

The insignificance of the correlation between the cost of the national currency and the volume of currency sales in the interbank foreign exchange market (USD million in equivalent) and the deficit of the consolidated budget (in% of GDP) indicates the absence of a market mechanism of exchange rate formation. Under the unchanged socio-economic conditions, the upward trend in the capacity of the national currency market will continue in the long-term run.

Further studies involve the study of macroeconomic factors that will serve as fundamental factors to smooth exchange rate volatility.

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УКРАИНАНЫҢ ВАЛЮТА НАРЫҒЫНЫҢ ДАМУ ТЕНДЕНЦИЯЛАРЫ

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ТЕНДЕНЦИИ РАЗВИТИЯ ВАЛЮТНОГО РЫНКА УКРАИНЫ

Аннотация. На современном этапе экономического развития страны валютный рынок определяется сложными экономическими отношениями, которые связаны с операциями купли-продажи иностранной валюты для обслуживания операций в сфере торговли и бизнеса. Рост открытости национальной экономики и интеграция Украины в мировую экономическую систему становятся причинами усиления влияния внешних и внутренних факторов на валютный рынок, рост волатильности обменного курса национальной валюты и обусловливают высокую рискованность операций на валютном рынке. Это, в свою очередь, уменьшает привлекательность экономики для ведения бизнеса. Связывая национальную экономику с мировым рынком через механизм валютных отношений, обменный курс национальной валюты имеет тесную взаимосвязь со всеми экономическими процессами. С одной стороны, он подвергается воздействию сложного комплекса эндогенных и экзогенных макроэкономических факторов, с другой – влияет на финансовое состояние страны. От курса национальной валюты зависит конкурентоспособность товаров отечественного производства на международных рынках, объемы и направление внешнеэкономических связей, движение финансовых потоков. В этом контексте обменный курс гривны рассматривается как важный показатель экономического развития страны, действенный инструмент осуществления валютной политики Центральным банком и ключевая характеристика состояния валютного рынка. Именно поэтому возникает необходимость повышения эффективности функционирования валютного рынка в Украине, что и обусловило выбор темы исследования.

Цель исследования заключается в определении особенностей конъюнктуры национального валютного рынка и установлении тенденций изменения основных показателей его деятельности. Особое внимание уделяется анализу тенденций колебания обменного курса гривны по отношению к доллару США и евро, а также факторам, вызывающим нестабильность валютного рынка Украины.

В данном исследовании определены особенности функционирования валютного рынка Украины на протяжении 2015-2019 гг. На основе анализа динамики обменного курса гривны выделены основные этапы изменения курса и установлено определяющие факторы изменения валютного курса гривны относительно доллара США и евро на каждом из этапов. Для первого периода (январь 2016г.– январь 2017г.) характерными были, во-первых, девальвация гривны на 7,2% по отношению к доллару США и 4,3% относительно евро, во-вторых, поддержка относительной стабильности обменного курса гривны с помощью интервенций как правило в форме валютных аукционов. Для второго периода (январь 2017г. - январь 2018г.) характерны усиленные курсовые колебания, гривна девальвировала только на 3,2% относительно доллара США и потеряла 12% стоимости относительно евро. Основными причинами этого были расходы на обслуживание внешнего долга и отрицательный внешнеторговый баланс. На третьем этапе (февраль 2018 г. - ноябрь 2019г.) началось формирование нового тренда: динамика обменного курса гривны к доллару США отмечается постепенным укреплением курса национальной валюты.

Проведена оценка конъюнктуры национального валютного рынка и основных показателей, которые позволяют оценить эффективность его функционирования. К ним относятся золотовалютные резервы, валютные интервенции и валовой внешний долг. В течение 2016 г. - 11 месяцев 2019 г. сальдо валютных интервенций было положительным, что позволяет Центральному банку выкупать излишки валюты на валютном рынке. Результатом наличия избыточного предложения валюты на валютном рынке является рост объемов международных резервов НБУ и ревальвация гривны.

С целью выявления курсообразующих факторов применены методы корреляционного анализа и установлено синхронность в динамике отдельных макроэкономических показателей и валютных курсов гривны относительно доллара США и евро в течение 2015 г. - 11 месяцев 2019г. Установлено, что общим для обоих курсов валют является существенность связи с внешним долгом и золотовалютными резервами НБУ. Несущественность связи обнаружена с объемами продажи валюты на межбанковском валютном рынке и дефицитом сводного бюджета в% к ВВП. С другими факторами плотность связи каждой пары курсовых соотношений отличается. Проанализировано соотношение объемов купли-продажи иностранной валюты на наличном валютном рынке. Согласно полученных данных, сделаны предположения о тенденциях развития национального валютного рынка на будущее.

Ключевые слова: валютный рынок, валютный курс, интервенции, валютно-курсовая политика, международные резервы, Национальный Банк Украины.

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FORECAST OF DEVELOPMENT OF THE GLOBAL E-COMMERCE MARKET

Abstract. Theoretical analysis of the concept of "e-commerce" was carried out. Based on the adaptive brown models of the first and second orders, the Holt linear exponential smoothing model, and the Box-Jenkins model, the forecast of the world e-commerce market volumes for 2020-2022 was constructed. The reliability and adequacy of the forecast models were evaluated. The basic, optimistic and pessimistic scenarios for the development of the global e-commerce market for 2020-2022 are highlighted and described. According to the basic development scenario, the market is expected to continue its active growth at the level of 18.4 ± 3.5% per year until 2022. At the same time, there is a tendency to decrease the growth rate from 19.61% in 2020 to 17.21% in 2022, due to the geographical change in the growth trend of Internet penetration from developed countries to low-income countries in Africa. The analytical dependence of the e-commerce influence on the growth of the world economy is constructed, which shows, that the increase in the volume of the world e-commerce market by $ 1 billion increases global GDP by $ 4.99 billion. Based on the constructed model of the relationship between global GDP and the volume of the global e-commerce market, the forecast of global GDP growth in 2020-2022 by 4.0 ± 1.0% annually is constructed. The increase in the share of the e-commerce market in global GDP in 2022 compared to 2019 is projected at 47.5%.

Key words: e-commerce, forecast, adaptive models, regression analysis, global gross domestic product, regions, forecast models, world market volume, household income, retail trade volumes.

The relevance of the topic. Modern reality is characterized by the rapid development of the information and communication technologies, which, while actively developing, generate the appearance of a huge number of socio-economic processes in all spheres of human activity. For the economic sphere, e-Commerce is such a phenomenon. The rapid development of information and communication technologies, including the Internet, creates fundamentally new conditions for the business development: the formation of new markets, the emergence of fundamentally new offers, the expansion of demand for goods and services, etc. Widespread use of information technologies, along with globalization, is the factor that determines the nature of the development of the modern economy, as well as the problems, that need to be investigated in the new conditions [1, P.65]. These new development includes the development of e-business, in particular, e-commerce. At the moment, there are few studies in the economic literature, that study the theoretical foundations of e-commerce and its impact on the development of the world economy, and there is no clear and generally accepted definition of the concept of "e-commerce". Predictive estimates of e-commerce development consider only one development scenario [2, p.15].

Materials and methods of research. Among the most common forecasting methods, there are trend methods, based on growth curves and adaptive methods. Both groups of methods have their own characteristics. Trend models are used only for a long time series, containing more than 10 observations, so they do not fit the nature of the original data (table 1).

Table 1 – Dynamics of retail trade volume in the e-commerce market [3]

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Volume of Global Commerce, billion US dollars, USA	–	1 060	1 250	1 336	1 548	1 845	2 382	2 928	3 535

The most well-known adaptive methods include: the random walk model, the moving average model, the brown exponential smoothing model (zero, first, and second orders), the Holt linear exponential smoothing model, the winters model, and the Box-Jenkins model.

Research results. Theoretical analysis of the diversity of the concept of "e -commerce, presented in the works [3, p.21], it allowed to use the Euler-Venn diagrams in order to formulate the concept of "e-commerce" "E-commerce is a type of commercial activity, carried out entirely or partially in a virtual electronic environment, in which information and transactional interactions are carried out on the basis of the use of information and communication technologies in order to ensure higher economic efficiency compared to traditional types of commercial activities" [4]. Based on the formulated concept of e-commerce, the time series of the world e-commerce market was determined (table 1) and built a forecast for 2020-2022 using adaptive brown models of the first and second orders, the Holt linear exponential smoothing model and the Box-Jenkins model. Expert analysis of the built adaptive predictive models of e-commerce market volumes showed that the condition for the ratio of predicted values relative to the last values of the time series level is fulfilled in the case of three models: Brown's Linear Exponential Smoothing and Brown's Quadratic Exponential Smoothing, and the Box-Jenkins autoregressive model (Arima Model).

The forecast accuracy for this model is 96.6 %. Second in adequacy is the second-order brown model. The forecast accuracy for this model is 94 %. The third most adequate model is the first - order brown model with a forecast accuracy of 91 % (figure 1).

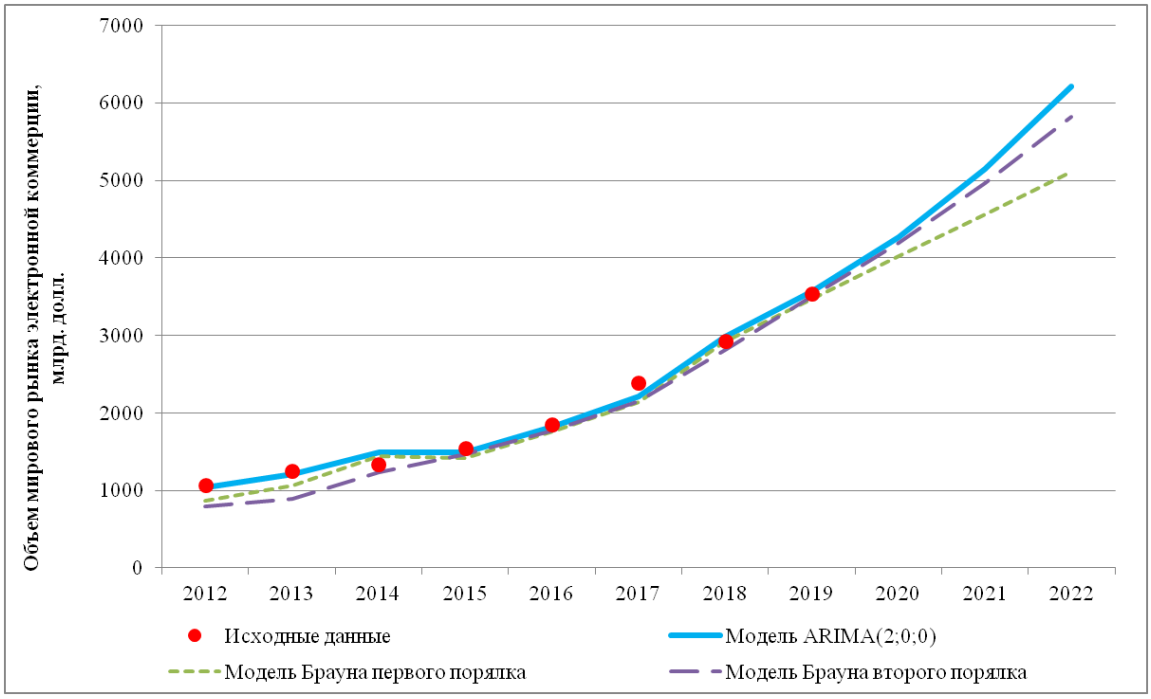

Figure 1 – Results of the global e-commerce market forecast, based on adaptive models

Thus, the analysis shows that the most adequate of the presented models is the Arima model (table 2). In the second place in terms of statistical characteristics is the second-order brown model, and in third place is the first-order brown model. The forecast values for these models are shown in table 2. Each of the statistical models predicts the continued rapid development of the global e-commerce market until 2021.

Table 2 – Forecast values of retail trade volumes in the global e-commerce market by predictive adaptive models

Period	Average forecast values for the model, USD billion.	Average chain growth, %
Arima (p = 2, d = 0, q = 0)		
2020	4265,9 ± 251,4	19,49%
2021	5146,56 ± 541,7	20,64%
2022	6208,07 ± 887,0	20,63%
Brown's Quadratic Exponential Smoothing (a = 0,3945)		
2019	4194,3 ± 271,3	19,61%
2020	4965,35 ± 472,7	18,38%
2021	5819,8 ± 588,5	17,21%
Brown's Linear Exponential Smoothing (a = 0,9999)		
2019	4019,96 ± 283,6	15,72%
2020	4565,94 ± 634,1	13,58%
2021	5111,93 ± 1061,0	11,96%
Forecast e-Marketer		
2019	4206,0	19,0%
2020	4927,0	17,1%
2021	5695,0	15,6%

In order to make a final choice in favor of one of the models, we will analyze the market development, estimates according to the statistical portals Statista (The Statistics Portal) and e-marketer, whose data were used in the formation of the analyzed time series of retail volumes in the global e-commerce market [5].

From the point of view of e-marketer portal experts, the volume of retail sales in the e-commerce market for 2020 will be $ 4,206 billion. $ 4,927 billion in 2021. $ 5695 billion for 2022, for 2023-6542 billion dollars [6]. Statista data shows that they are used by such portals as Shopify Plus [7], Monetha [8], The Next Scoop and others.

Knowing that according to the forecast data of the Statistics Portal, on average over three years (2020-2022), the growth of retail sales in the global e-commerce market will be about 18.1 %, we will make the final choice in favor of the second-order brown model. From table 2, you can see that the forecast values provided by the e-marketer portal have the closest similarity with the forecast values of the market volume obtained using the second-order brown model. The predictive polynomial for this model was determined by the authors based on the discounted brown least squares method:

$$y(t) = 3488,9 + 638,3*t + 38,4*t^2.$$

The results obtained using the Arima model and the first-order Brown model are almost equally distant from the data, provided by the e-marketer portal.

The forecast values obtained from the first-order Brown model have a negative relative deviation with e-marketer data and show the lowest growth of the e-commerce market, compared to the other two statistical models were analyzed. Accordingly, the forecast results obtained using the first-order Brown model with the parameter a = 0.9999 should be considered a pessimistic (conservative) scenario for the development of the world e-commerce market until 2022.

According to the optimistic scenario, the rapid growth of retail trade in the global e-commerce market is expected to continue, on average, by 20-25 % per year. Therefore, the second condition for the optimistic scenario is the speeding up of reducing the cost of mobile data traffic, the third - the increase in geographical accessibility of mobile Internet and free access points Wi-Fi, the fourth is the emergence of new technologies for mobile devices that enhance the ease of use, as well as contributing to increasing the availability of existing models of phones with the release of a growing number of tech leaders. However, it should be noted that the scenario does not require simultaneous fulfillment of all its conditions.

Also, the conditions that incline the global e-commerce market to develop according to an optimistic scenario include: the emergence of new more effective delivery methods, the creation of interstate measures to support activities in the field of e-commerce, etc. According to the pessimistic development scenario, the growth of retail trade in the global e-commerce market is projected to decrease from 19,0 % in 2020 to 15,6 % in 2022 (table 2). By analogy with the formation of a description for an optimistic forecast of the development of the e-commerce market, the main conditions for the implementation of a pessimistic (conservative) scenario will be:

- slowing current trends of the global spread of broadband access to the Internet;
- no reduction or increase in the cost of mobile traffic for any reason (for example, legislation).

The baseline scenario is based on the continuation of current trends in the development of the global e-commerce market and is the most likely scenario. According to this scenario, retail trade volumes in the global e-commerce market are expected to grow by an average of 18,4 % per year by 2022 (figure 2). In 2022, the volume of the global e-commerce market will exceed 5 trillion dollars for the first time, which will surpass the same indicator in 2019 by 64,6 %, and the growth compared to 2012 will be 5.5 times.

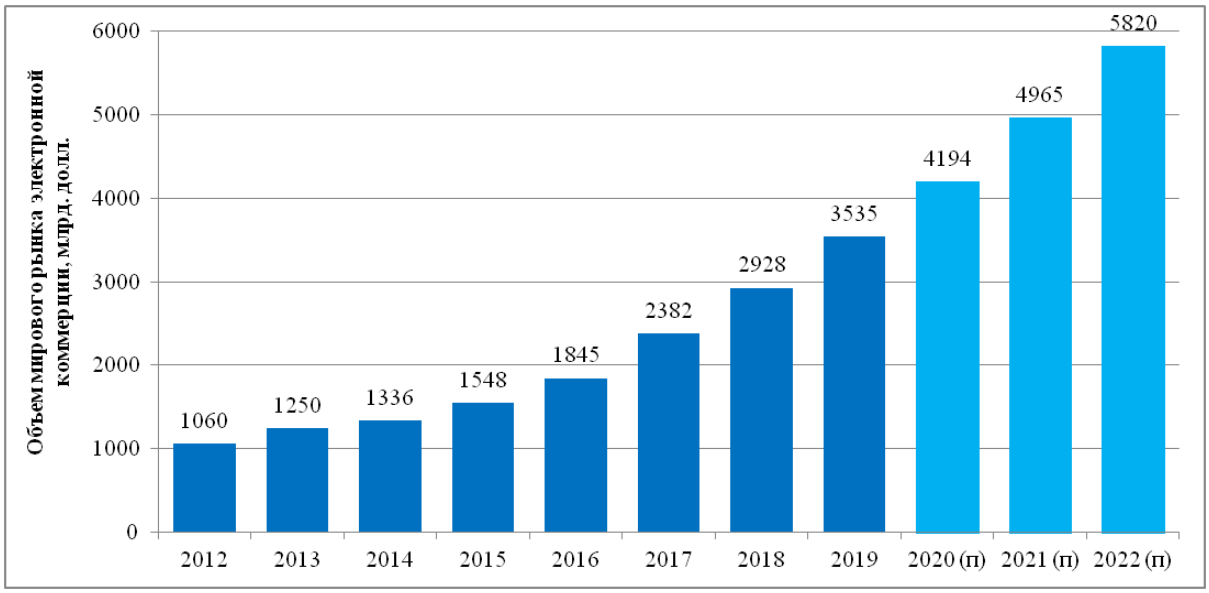

Figure 2 – Global e-commerce market volume Forecast: baseline scenario (in USD billion)

But at the same time, there is a tendency to decrease the growth rate from 19,6% in 2020 to 17,2% in 2022. This can be explained by the geographical change in the trend of increasing Internet penetration from developed countries (with a relatively high level of saturation) to the countries with less developed economies, where the Internet is not yet sufficiently developed. So, for 2018 the number of Internet users in Western Sahara (a territory in North Africa) increased by 364 %, in the Republic of Djibouti (a state in East Africa) - by 203 %, in Tanzania (East Africa) - 173 %, in the Republic of Niger (West Africa) - 146% in Afghanistan (Central Asia) - 142 % in the Republic of Côte D'Ivoire (West Africa) - 69 % [9, p.145], etc. However, the vast majority of them are low income countries in Africa. The total monetary volume of transactions made by such countries using the Internet makes a small contribution to the volume of the global e-commerce market.

The largest contribution to the pace of development of the global e-commerce market will be made by the most technologically advanced regions, such as the countries of Europe, North America, as well as Japan and China. In turn, the e-commerce market of each of these countries will develop in its own way depending on local national, demographic and other factors [9, p.146].

The development of the global e-commerce market directly affects the growth of the world economy. Analysis of the correlation between the global gross domestic product (GDP) and the volume of the world e-commerce market shows a high value of the pair correlation coefficient - 0.9138 with a coefficient of determination equal to 0.835 and a sample-adjusted coefficient of determination equal to 0.807 (table 3, figure 3).

Table 3 – Dynamics of Global GDP and Volume of the Global E-Commerce Market

Year	2012	2013	2014	2015	2016	2017	2018	2019
Retail trade volume in the global e-commerce market, USD billion	1 060	1 250	1 336	1 548	1 845	2 304	2 842	3 535
World GDP at current prices [26], in billions of dollars	74 619	76 750	78 832	74 602	75 653	80 051	84 740	87 265

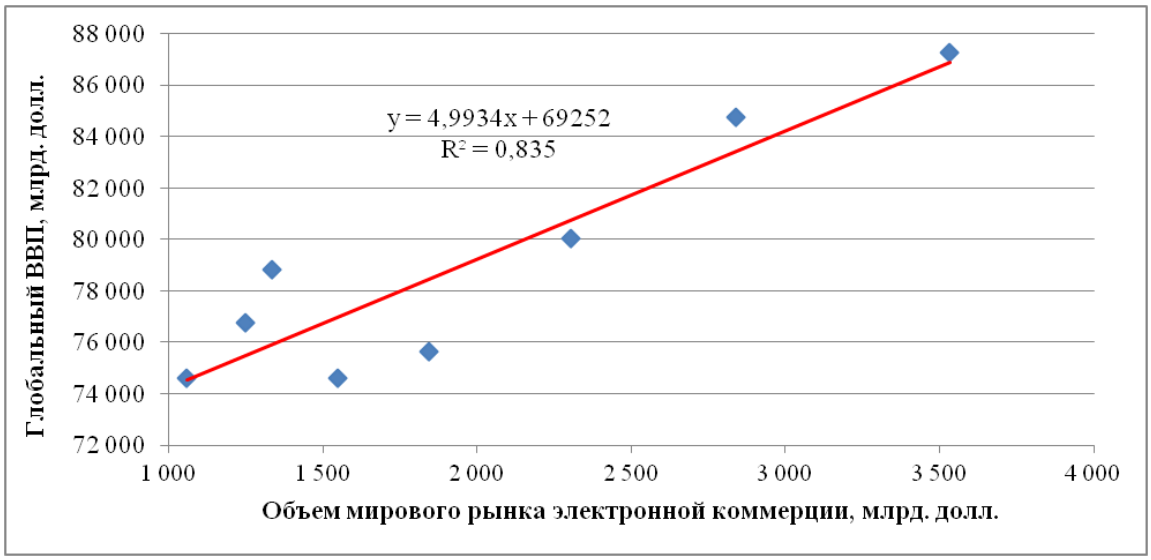

Figure 3 – Regression model of the dependence of global GDP and the volume of the world e-commerce market

The adjusted coefficient of determination, which shows the share of GDP variation, explained by the impact of the growth of the global e-commerce market, in our case is 0,807, which means that the variation of world GDP by 80,7% is due to the influence of the world e-commerce market, by 19,3% - a variety of other factors [10]. The regression model of the impact of the development of the world e-commerce market on global GDP is shown in figure 3. It is significant with a confidence probability of 99.85%:

$$y = 4{,}9934*x + 69\ 251{,}88$$

where y is global GDP and x is the volume of the global e-commerce market.

Consequently, an increase in the global e-commerce market for every billion US dollars leads to an increase in global GDP of $ 4,99 billion. Substituting the initial data in the model of the dependence of world GDP on retail trade volumes in the world e-Commerce market, we get the following forecast values of world GDP for 2020-2022 (table 4):

Table 4 – Forecast values of world GDP based on the basic scenario
for the development of the world e-commerce market (in billions of dollars USA)

Year	Lower bound of the forecast	Average	Upper bound of the forecast
2020 (п)	88 342,67	90 195,89	92 049,06
2021 (п)	91 685,53	94 046,08	96 406,64
2022 (п)	95 373,89	98 312,73	101 251,6

Thus, the volume of world GDP under the basic scenario for the development of the world e-commerce market in 2020 will be 90,195. 89 ± 1,853. 2 billion dollars, in 2021 - 94,046, 1 ± 2,360, 6 billion dollars, in 2022 - 98,312. 73 ± 2,938. 8 billion dollars.

Based on the available data, you can get the following values for the share of e-commerce in global GDP (table 2 and 4): according to the basic development scenario, the contribution of e-commerce to the world economy is projected to grow from 4 % in 2019 to 5,9 % in 2022.

It should be noted, that many international organizations (APEC, BRICS, OECD) recognize the high growth potential of the world economy due to the development of e-commerce. At the same time, the governments of many countries (the United States, China, South Korea, the European Union, etc.) create and implement special programs to stimulate e-commerce in their countries. For example, the Chinese government supports its key electronic platforms (Alibaba, WeChat, etc.), optimizes customs procedures, introduces tax incentives for retail exports, encourages the operation of electronic payment systems, introduces innovations in various fields (production, trade, logistics), and optimizes existing legislation for e-commerce (for example, updating the law on consumer protection) [10, p.398].

Conclusion. Adaptive models are used to forecast the development of the global e-commerce market. Three scenarios for the development of the global e-commerce market up to 2022 are identified and described, with the definition of a forecast polynomial for the basic (most likely) development scenario. According to this scenario, the market is expected to continue its active growth at the level of 18.4 ± 3.5% per year until 2022. At the same time, there is a tendency to decrease the growth rate from 19.61% in 2020 up to 17.21 % in 2022, due to the geographical shift in the growth trend of Internet penetration from developed countries to low-income African countries. As a result of the correlation and regression analysis, it is proved that the development of e-commerce has a significant impact on the growth of the world economy. Based on the built model of the relationship between global GDP and the volume of the world e-commerce market, the forecast of global GDP is constructed, which shows that the average annual growth of global GDP in 2020-2022 will be 4.0 ± 1.0% (table 4), and the e-commerce market share in global GDP will increase by 47.5% in 2022 compared to 2019.

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ӘЛЕМДІК ЭЛЕКТРОНДЫҚ КОММЕРЦИЯ НАРЫҒЫНЫҢ ДАМУ БОЛЖАМЫ

Аннотация. «Электрондық коммерция» ұғымына теориялық талдау жүргізілді. Эйлер-Венн диаграммасының көмегімен «электрондық коммерция» ұғымының алуан түрлілігін талдау негізінде «электрондық коммерция» ұғымы (ағылш. e-commerce) дегеніміз – виртуалды электрондық ортада толық немесе ішінара жүзеге асырылатын коммерциялық қызмет түрі, онда ақпараттық және транзакциялық өзара қатынастағы коммерциялық қызметтің дәстүрлі түрлерімен салыстырғанда жоғары экономикалық тиімділікті қамтамасыз ету мақсатында ақпараттық-коммуникациялық технологияларды қолдану негізінде жүзеге асырылады». Әлемдік электрондық коммерция (2012-2019 жылдар) нарығы көлемінің уақытша қатарына бірінші және екінші тәртіптегі Брауның бейімделу моделі, Хольтты сызықтық экспоненциалды тегістеу моделі және Бокс-Дженкинс моделі негізінде 2020-2022 жылдарға арналған электрондық коммерцияның өсу болжамы құрылды. Болжамдық модельдердің дұрыстығы мен барабарлығы бағаланды. 2020-2022 жылдарға арналған әлемдік электрондық коммерция нарығын дамытудың базалық, оптимистік және пессимистік сценарийлері бөлініп сипатталған. Базалық сценарий электрондық коммерцияның әлемдік нарығын дамытудың ағымдағы үрдістерін жалғастыруға негізделеді және оқиғаларды дамытудың ең ықтимал нұсқасы болып саналады. Осы сценарийге сәйкес 2022 жылға дейін электрондық коммерцияның әлемдік нарығында бөлшек сауда көлемі орташа есеппен жылына 18,4% өседі деп күтілуде. 2022 жылы әлемдік электрондық коммерция нарығының көлемі алғаш рет 5 триллион доллардан асады, бұл 2019 жылдың ұқсас көрсеткіштен 64,6%-ға асып түседі, ал 2012 жылмен салыстырғанда өсім 5,5 есені құрайды. Сонымен қатар өсу жылдамдығы 2020 жылғы 19,6%-дан 2022 жылы 17,2%-ға дейін төмендеген. Мұны дамыған елдерден экономикасы төмен, яғни ғаламтор да әлі жеткілікті дамымаған елдермен салыстырмалы түрде алғанда жоғары қанықтылығы бар интернеттің ену динамикасының географиялық өзгерісі арқылы түсіндіруге болады. Бұл ретте олардың басым көпшілігі – халық табысының төмен деңгейі негізінде сипатталатын Африка елдері. Мұндай елдер Интернет желісін пайдалана отырып жасайтын мәмілелердің жиынтық ақшалай көлемі электрондық коммерцияның әлемдік нарығының көлеміне елеусіз үлес береді. Электрондық коммерцияның әлемдік нарығының даму қарқынына технологиялық тұрғыдан дамыған Еуропа, Солтүстік Америка елдері, сондай-ақ Жапония мен Қытай сияқты өңірлер ірі көлемде үлес қосады. Өз кезегінде, осы елдердің әрқайсысының электрондық коммерция нарығы жергілікті ұлттық, демографиялық және өзге де факторларға байланысты өз

жолымен дамитын болады. Жүргізілген корреляциялық-регрессиялық талдау нәтижесінде электрондық коммерцияның дамуы әлемдік экономиканың өсуіне елеулі әсер ететіні дәлелденді. Электронды сауданың әлемдік экономиканың өсуіне әсер ететін аналитикалық тәуелділігі әлемдік электрондық сауда нарығының 1 млрд. долларға артуы әлемдік ЖІӨ-нің 4,99 млрд. жоғарылатады. Жаһандық ЖІӨ мен электрондық коммерцияның әлемдік нарығының көлемі арасындағы тәуелділік моделі негізінде 2020-2022 жылдары жыл сайын 4,0 ± 1,0%-ға жаһандық ЖІӨ өсімі болжамы салынды. 2019 жылмен салыстырғанда 2022 жылы жаһандық ЖІӨ-дегі электрондық коммерция нарығының үлесін арттыру 47,5% деп болжануда.

Түйін сөздер: электрондық коммерция, болжам, бейімделу модельдері, регрессиялық талдау, жаһандық жалпы ішкі өнім, өңірлер, болжамды модельдер, әлемдік нарық көлемі, халық табысы, бөлшек сауда көлемі.

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ПРОГНОЗ РАЗВИТИЯ МИРОВОГО РЫНКА ЭЛЕКТРОННОЙ КОММЕРЦИИ

Аннотация. Проведён теоретический анализ понятия «электронная коммерция». На основе анализа многообразия понятия «электронная коммерция» с помощью диаграмм Эйлера-Венна сформулировано понятие «электронная коммерция» (от англ. e-commerce): «электронная коммерция – это вид коммерческой деятельности, осуществляемый полностью или частично в виртуальной электронной среде, при которой информационные и транзакционные взаимодействия осуществляются на основе применения информационно-коммуникационных технологий с целью обеспечения более высокой экономической эффективности по сравнению с традиционными видами коммерческой деятельности». На основе временного ряда объемов мирового рынка электронной коммерции (2012-2019 годы) построен прогноз роста электронной коммерции на 2020-2022 годы на основе адаптивных моделей Брауна первого и второго порядков, модели линейного экспоненциального сглаживания Хольта и модели Бокса-Дженкинса. Оценены достоверность и адекватность прогнозных моделей. Выделены и описаны базовый, оптимистический и пессимистический сценарии развития мирового рынка электронной коммерции на 2020-2022 годы. Базовый сценарий основывается на продолжении текущих тенденций развития мирового рынка электронной коммерции и является наиболее вероятным вариантом развития событий. Согласно данному сценарию до 2022 года ожидается активный прирост объемов розничной торговли на мировом рынке электронной коммерции, в среднем, на 18,4 % в год. В 2022 году объем мирового рынка электронной коммерции впервые превысит 5 триллионов долларов, что превзойдет аналогичный показатель 2019 года на 64,6 %, а рост по сравнению с 2012 годом составит 5,5 раза. В то же время наблюдается тенденция снижения скорости прироста с 19,6 % в 2020 году до 17,2 % в 2022 году. Это можно объяснить географической сменой тенденции роста проникновения Интернета из развитых стран с относительно высоким уровнем насыщения в страны с менее развитой экономикой, где Интернет еще недостаточно развит. При этом подавляющее большинство из них – страны Африки, характеризующиеся низким уровнем дохода населения. Совокупный денежный объем сделок, совершаемых такими странами с использованием сети Интернет, дает незначительный вклад в объем мирового рынка электронной коммерции. Наибольший вклад в темпы развития мирового рынка электронной коммерции будут вносить самые развитые в технологическом аспекте регионы, каковыми являются страны Европы, Северной Америки, а также Япония и Китай. В свою очередь, рынок электронной коммерции каждой из этих стран будет развиваться своим путем в зависимости от местных национальных, демографических и иных факторов

В результате проведенного корреляционно-регрессионного анализа доказано, что развитие электронной коммерции оказывает значимое влияние на рост мировой экономики. Построенная аналитическая зависимость влияния электронной коммерции на рост мировой экономики показывает, что увеличение объемов мирового рынка электронной коммерции на 1 млрд. долл. увеличивает глобальный ВВП на 4,99 млрд. долл. На основе построенной модели зависимости между глобальным ВВП и объемом мирового рынка электронной коммерции построен прогноз прироста глобального ВВП в 2020-2022 гг. на 4,0 ± 1,0% ежегодно. Увеличение доли рынка электронной коммерции в глобальном ВВП в 2022 году по сравнению с 2019 годом прогнозируется на 47,5%.

Ключевые слова: электронная коммерция, прогноз, адаптивные модели, регрессионный анализ, глобальный валовой внутренний продукт, регионы, прогнозные модели, объем мирового рынка, доход населения, объемы розничной торговли.

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STATISTICAL ANALYSIS OF VARIABILITY OF DATA OF THE AGRARIAN SECTOR OF KAZAKHSTAN ECONOMY

Abstract. The article studies the variability of a data group formed from indicators of the agricultural sector of the economy of Kazakhstan, using one of the methods of reducing dimensionality as a factor analysis. The data of 1993–2018, i.e. for 26 years. The analysis included: a) indicators of GDP - the agrarian sector of the economy as a whole and by crop and livestock industries; b) indicators of productivity and gross harvest by type of crop. Statistical processing of the source data was performed using the STATISTICA_10 software package. The results of statistical processing of primary data - GDP indicators: a) fluctuations in GDP data, estimated by the coefficient of variation, were in the range of 65-67%; b) according to the values of pair correlation coefficients (0,97 ... 0,99), it can be argued that the considered GDP indicators are interdependent variables with a close correlation. It was found that almost 90% of the variance of the variables, estimated by their total dispersion, is a consequence of the influence of the three identified factors. The first factor explaining the variability of the main part of the variables, in our opinion, can be taken as the «specific gravity» of the influence of natural and climatic conditions. Close correlation relationships have been established (correlation coefficients from -0,72 to -0,96) between the first factor and all variables of the «productivity» group. The influence of the first factor is also noticeable in relation to GDP indicators, this can be judged by the values of the correlation coefficients: -0,85; -0,85; -0,85. Other identified factors show the level of influence of other objective reasons that are not yet amenable to logical explanation.

Key words: multivariate statistical analysis, factor analysis, correlation matrix, correlation coefficient, variance.

Introduction. The study is devoted to the disclosure of the internal structure of the relationships in the data array used to assess the state of the agricultural sector of the economy of Kazakhstan. Such work involves the statistical processing of raw data using multivariate statistical analysis methods. From a usual analysis of the dynamics of indicators, you can also get important information about the nature and patterns of data changes, but such a study, as a rule, does not provide a complete picture of the relationships. One of the methods of reducing dimensionality - factor analysis allows you to group the source data by the influence of external factors. That is, in essence, it is possible to create a statistical model of the problem in which the variability of all parameters is explained by the identified factors. The weight or significance of one or another factor can be estimated by the value of its share in the total variance of variables. And the close connection of each parameter of the problem with a specific factor is estimated by the correlation coefficient.

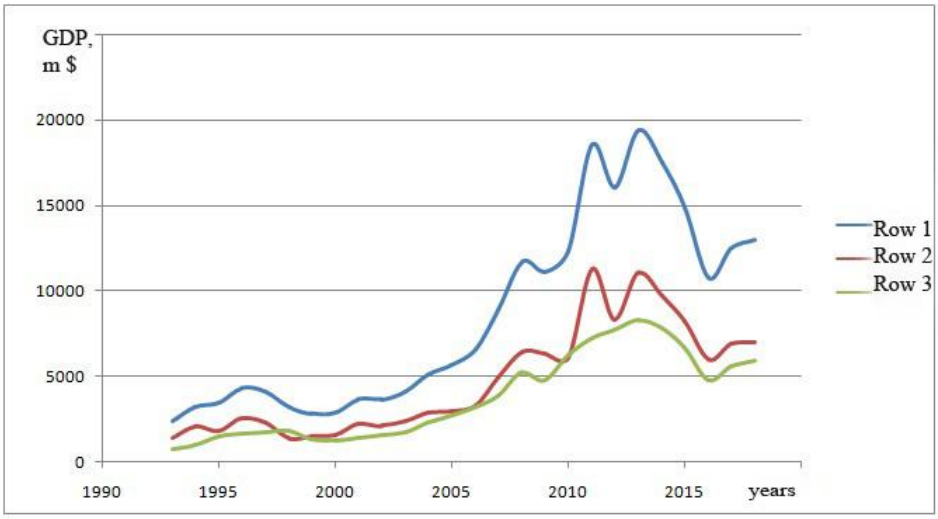
Analysis of publications. Both the current state of the agricultural sector of the economy of Kazakhstan and the history of its development are considered in detail in many analytical works [1-7]. An important outcome of the study of the state of affairs is the conclusion that the country's agriculture, being an important sector of the economy, has not yet fully realized its potential capabilities.

As official data for assessing the state of the economy of the country as a whole, as well as its industries, GDP indicators are expressed in US dollars. For example, the World Bank provides the following data on the economy of Kazakhstan for 2018 [8]: a) GDP of the economy, billion $ - 179.34; b) the share of agricultural in GDP of the economy, % - 4,4. And here are the indicators of GDP of the economy of Kazakhstan for 2018, both in tenge and in dollars [9-10]: a) in tenge - 61819.5 billion, b) in US dollars - 179.34 billion. Here, for conversion into dollars, the values of GDP in tenge, the average annual exchange rate of the US dollar for 2018, equal to 344 tenge per dollar, was used. The GDP of the country's agricultural sector in 2018 amounted to 4,474.1 billion tenge [9-10]. At the rate of 344, you can determine the value of agricultural GDP in dollars: $ 13 billion. Then the share of the agricultural sector in total GDP for 2018 is 7,2%. The fact that in modern practice different methods are used to calculate the share of the agricultural sector in the GDP of the country's economy is also confirmed by the article [11]: the share of the agricultural sector in the country's GDP for 2017, in % - 5,7; gross agricultural income (in billions of $) – 11,5. For information, according to the World Bank, the share of the agricultural sector in the economy of Kazakhstan in 2017 amounted to 4,52% [8].

Research in the agricultural sector of the economy, as a rule, comes down to an analysis of the dynamics of indicators using correlation and regression analyzes. From a usual analysis of the dynamics of indicators, you can also get important information about the nature and patterns of data changes, but such a study does not provide a complete picture of the relationships. Multivariate methods of statistical analysis, the use of dimensionality reduction, as factor analysis is sometimes called, provides an opportunity to reveal the logical structure of a complex phenomenon [12-17]. The main assumption of factor analysis is that phenomena in a certain field of research can be described by a relatively small number of factors. It is assumed that in the study area there is a pattern that combines the studied data into some groups. Moreover, it is believed that each group of data has a certain factor. The term «factor» is used here in the sense of an objective reason, which unites heterogeneous data. That is, in essence, it is possible to create a statistical model of the problem in which the variability of all parameters is explained by the identified factors. The weight or significance of one or another factor can be estimated by the value of its share in the total variance of variables. And the close connection of each parameter of the problem with a specific factor is estimated by the correlation coefficient.

The results of the research. The agricultural sector of the economy is considered as a complex system, estimated using a variety of variables and investigated using a method of multivariate statistical analysis such as factor analysis. As the source of data used, «Basic socio-economic indicators of the Republic of Kazakhstan for 1991-2019»[9]. The data of 1993–2018, i.e for 26 years. From the entire list of data from the agricultural sector of the country's economy, the following indicators were included in the analysis: a) GDP of the agricultural sector of the economy as a whole and by crop and livestock sectors; b) crop production sectors: gross harvest and productivity by types of agricultural crops. Variables subjected to statistical analysis: GDP, million US dollars: - agricultural sector of the economy as a whole (v1); plant growing industry (v2); - livestock industry (v3); productivity, kg / ha: cereals (including rice) and legumes; sunflower seeds; cotton; sugar beets; tobacco; potatoes; open ground vegetables. Gross harvest, thousand tons: cereals (including rice) and legumes; sunflower seeds; cotton; sugar beets; tobacco; potatoes; open ground vegetables. The GDP indicators for the crop and livestock industries, presented in tenge, are converted into US dollars using the average annual exchange rates of the dollar. Statistical processing of the source data was performed using the STATISTICA_10 software package.

Figure shows graphs of changes in GDP of the agricultural sector of the economy (Row 1), as well as GDP for the sectors of crop production (Row 2) and livestock (Row 3). From a visual inspection of the graphs it can be seen that the patterns of changes in the GDP indicators of the agricultural sector and the GDP of the crop sector are almost identical.



Graphs of changes in 1993-2018 indicators: GDP of the agricultural sector of the economy (Row 1); GDP of the crop industry (Row 2); GDP of the livestock industry (Row 3). NB: developed by the authors

Statistical characteristics of the results of processing primary data - GDP indicators are given in table 1.

Table 1 – Results of primary data processing. NB: developed by the authors

Indicators	Average, million $ US	Standard deviation, million $	Coefficient of variation, %
GDP agriculture as a whole, million $	8524.873	5600.198	65.6
GDP of the crop industry, million $	4705.826	3159.921	67.1
GDP of the livestock industry, million $	3760.138	2492.750	66.2

The variability of GDP indicators over the considered period of time, estimated by the value of the coefficient of variation, was in the range of 65-67%. In order to analyze the interconnections between the GDP indicators, eable 2 shows the pair correlation coefficients.

Table 2 – Correlation matrix

Variables		v1	v2	v3
GDP of agriculture as a whole	v1	1.00	0.99	0.99
GDP of the crop industry	v2	–	1.00	0.97
GDP of the livestock industry	v3	–	–	1.00

Of interest is the value of the pair correlation coefficient between v2 and v3: 0,97. The GDP indicators of the crop and livestock industries are interdependent variables with a close correlation. As is known, the pair correlation coefficient shows the degree of tightness of the relationship between only two variables under the indirect influence of other variables. That is, correlation analysis does not provide a complete picture of the relationships between variables. It is worth emphasizing that when interpreting the results of factor analysis, one of the important indicators of mathematical statistics is used, such as variance (the average square of the deviations), which reflects the measure of the scatter of data around the arithmetic mean. As can be seen from table No. 3, the main part of the variability of variables (which are included in the analysis), i.e. 87,3% of their total variance is due to three factors. Moreover, the first factor accounts for 65,5% of the total variance of variables, while the second factor accounts for 13,3%, and the third factor accounts for only 8,5%.

Table 3 – Full explained variance of variables. NB: developed by the authors

Factors	% the total variance of the variables	Cumulative variance, %
1	65.5	65.5
2	13.3	78.8
3	8.5	87.3

Simply put, almost 90% of the variation in variables estimated by their total dispersion is a consequence of the influence of three factors. Let's try to understand the situation.

Table 4 shows the correlation coefficients between all considered variables and identified factors.

Table 4 – Correlation coefficients between all variables and identified factors. NB: developed by the authors

Variables	Factor 1	Factor 2	Factor 3
GDP: agriculture in general	-0,85	0,45	-0,13
crop production industries	-0,85	0,44	-0,10
the livestock industry	-0,85	0,44	-0,18
Yield: – grain crops	-0,72	-0,30	0.18
– sunflower seed	-0,84	-0,37	0,10
– cotton's	-0,83	-0,06	-0,04
– sugar beet	-0,87	-0,34	-0,06
– tobaccos	-0,90	-0,15	0,02
– potato's	-0,98	-0,10	-0,04
– vegetables from the open ground	-0,96	-0,06	-0,15
Gross harvest: – grain crops	-0,64	-0,11	0,48
– sunflower seed	-0,91	0,001	0,22
– cotton's	-0,47	-0,62	-0,46
– sugar beet	0,25	-0,51	0,73
– tobaccos	0,29	-0,77	-0,48
– potato's	-0,95	0,04	0,18
– vegetables from the open ground	-0,98	0,01	-0,02
% the total variance	65,5	13,3	8,5

A close correlation (correlation coefficients from -0,72 to -0,96) with the first factor in the entire variable group «productivity». As regards the indicators of gross harvest, the situation is ambiguous here: fluctuations in the gross harvest of cotton, sugar beets and tobacco are largely dictated by the influence of the second and third factors (correlation coefficients: -0,62; 0,73; -0,77). For such an important indicator as the gross harvest of crops, the correlation coefficient with the first factor is only -0,64.

The influence of the first factor is also noticeable in relation to GDP indicators, this can be judged by the values of the correlation coefficients: -0,85; -0,85; -0,85. The first factor explaining the variability of the main part of the variables, in our opinion, can be taken as the «specific gravity» of the influence of natural and climatic conditions.

Let us try to exclude from the further analysis the variables of the GDP group. We will also conduct factor analysis with data from each of the remaining groups («yield» and «gross yield») separately. Of course, now the values of the correlation coefficients between variables and factors will be different than in table 4. The analysis showed that the variation in yield of all crops is dictated only by the influence of the first factor, i.e. 82,3% of the total variance of the variables of the «productivity» group are predetermined by the mentioned factor (table 5).

Table 5 – Correlation coefficients between the variables of the "yield" group and the first factor identified.
NB: developed by the authors

Yield	Factor 1
grain crop	-0,76
sunflower seed	-0,92
cotton's	-0,82
sugar beet	-0,94
tobaccos	-0,94
potato's	-0,97
vegetables from the open ground	-0,95
% the total variance	82,3

Table 6 shows the results of factor analysis of data generated only from gross harvest indicators for all crops.

Table 6 – Correlation coefficients between the variables of the "gross harvest" group and the identified factors.
NB: developed by the authors

Gross yield	Factor 1	Factor 2	Factor 3
grain crop	-0,71	-0,01	-0,44
sunflower seed	-0,94	0,06	-0,001
cotton's	-0,37	-0,88	0,04
sugar beet	0,12	-0,02	-0,95
tobaccos	0,40	-0,87	-0,03
potato's	-0,98	0,007	-0,01
vegetables from the open ground	-0,95	-0,08	0,19
% the total variance	51,6	22,2	16,4

The fact that fluctuations in the gross yield of cotton, sugar beet and tobacco are more dependent on the influence of the second and third factors, we already know from the analysis of the data in table 1. According to our version, the indicators of gross harvest of these crops are less dependent on natural and climatic conditions, since these crops are cultivated on irrigated areas. The variability of the indicators of the gross harvest of sunflower seeds, potatoes and vegetables is associated only with the influence of the first factor (correlation coefficients above 0,9). As for the statistical relationship between the data of the gross harvest of crops and the identified factors (correlation coefficients with the first factor -0,71 and the third factor -0,44, table 6), we will try to express our assumptions. The indicator of gross harvest of grain crops, as we know, includes data on the collection of rice and legumes cultivated in irrigated areas. If it is possible to analyze the variability of the gross harvest of grain crops without taking into account data on rice and legumes, the absolute influence of the first factor is likely to prevail.

Conclusion. The article analyzes the variability of indicators: a) GDP of agriculture as a whole and by crop and livestock industries; b) yield and gross harvest of crops. The practical value of the work is the created statistical model, in which the variability of a large set of parameters is explained by a small number of identified factors. Moreover, the significance of a factor is estimated by the value of its share in the total variance of variables. And to assess the tightness of the connection of each parameter of the problem with a specific factor, correlation coefficients are used. It is established that the factor that we called the factor of natural and climatic conditions has the greatest influence on the variability of the considered data. For example, more than 80% of the total variance of the yield indicators of all crops is explained only by this factor. Therefore, we consider it urgent to find innovative technologies that can ensure the sustainable functioning of the crop industry despite adverse environmental conditions. In conclusion, we hope that the study will contribute to an adequate and objective understanding of the characteristics of the agricultural sector of the economy of Kazakhstan, which is extremely necessary for developing relevant proposals for the development of the industry.

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ҚАЗАҚСТАН ЭКОНОМИКАСЫНЫҢ АГРАРЛЫҚ СЕКТОРЫ ДЕРЕКТЕР ӨЗГЕРІСІН СТАТИСТИКАЛЫҚ ТАЛДАУ

Аннотация. Мақалада факторлық талдау ретінде өлшемдікті төмендету әдістері арқылы Қазақстан экономикасының аграрлық секторының көрсеткіштері негізінде қалыптасқан деректер тобының өзгергіштік үдерісі зерттелді. 1993-2018 жылдар арасындағы, яғни 26 жыл көлеміндегі деректер талданды. Талдауға енгізілген жалпы мәліметтер: а) жалпы ішкі өнімнің үш көрсеткіші және өсімдік шаруашылығы мен мал шаруашылығы саласы бойынша экономиканың аграрлық секторы; б) ауыл шаруашылығы дақылдарының түрлері бойынша түсімділіктің және жалпы түсімнің он төрт көрсеткіші бойынша анықталды. Бастапқы деректерді статистикалық өңдеу STATISTICA 10 бағдарлама пакетін қолдану арқылы жүргізілді. Бастапқы ұсынылған деректерді – жалпы ішкі өнім көрсеткішін статистикалық өңдеу нәтижелері: а) вариация коэффициентімен бағаланатын жалпы ішкі өнім деректерінің ауытқуы 65-67% шегінде болды; б) корреляцияның жұптық коэффициентінің (0,97...0,99) мәндері бойынша жалпы ішкі өнімнің қаралған көрсеткіштері тығыз корреляциялық байланыста өзара тәуелді ауыспалы болып саналады. Факторлық талдау нәтижесін интерпретациялау кезінде математикалық статистиканың негізгі көрсеткіштерінің бірі дисперсия (ауытқудың орташа квадраты) қолданылды. Олардың жалпы дисперсиясы бағаланатын айнымалылардың таралуының 90%-ға жуығы анықталған үш фактор әсерінің салдары екені анықталды. Барлық ауыспалы «өнімділік» тобының бірінші факторы бар тығыз корреляциялық байланыс (-0,72-ден -0,96-ға дейінгі корреляция коэффициенті) орын алады. Бірінші фактордың әсері ішкі жалпы өнім көрсеткіштеріне қатысты, корреляция коэффициенттерінің мәніне қатысты да осылай айтуға болады: -0,85; -0,85; -0,85. Өнімнің жалпы жиналу көрсеткішіне қатысты жағдайда корреляция коэффициенттері бірмәнді емес: мақтаның, қант қызылшасының және темекінің жалпы жиналуының ауытқуы көбінесе екінші және үшінші факторлардың әсерімен (корреляция коэффициенттері: -0,62; 0,73; -0,77) орындалады. Дәнді дақылдарды жалпы жинау сияқты маңызды көрсеткіште бірінші факторы бар корреляция коэффициенті -0,64. Айнымалылардың негізгі бөлігінің өзгергіштігін түсіндіретін бірінші фактор, біздің ойымызша, табиғи-климаттық жағдай әсерінің «үлес салмағы» ретінде қабылдауға болады. Басқа анықталған факторлар логикалық түсінік берілгенге дейін өзге де (табиғи-климаттық жағдайдан басқа) объективті себептердің әсер ету деңгейін көрсетеді. Мақтаны, қант қызылшасын және темекіні жалпы жинау көрсеткіштерінің ауытқуы көбінесе екінші және үшінші факторлардың ықпалына байланысты екенін білеміз. Болжамымызға қарағанда, аталған дақылдардың жалпы түсімінің көрсеткіші табиғи-климаттық жағдайға, яғни бірінші фактордың ықпалына байланысы төмен, өйткені бұл дақылдар суармалы алқапта өсіріледі. Дәнді дақылдарды жалпы жинау деректері мен анықталған факторлар (бірінші фактормен -0,71 және үшінші фактормен -0,44 корреляция коэффициенті) арасындағы статистикалық тәуелділікке келетін болсақ, өз болжамымызды айтуға тырысамыз. Дәнді дақылдарды жалпы жинау көрсеткіші суармалы алқаптарда өсірілетін күріш пен бұршақ дақылдарын жинау жөніндегі деректерді қамтиды. Күріш және бұршақ дақылдары бойынша деректерді есепке алмағанда дәнді дақылдың жалпы жиналуының өзгергіштігін талдау мүмкіндігі кезінде бірінші фактор әсерінің абсолюттік басым болуы мүмкін. Бірақ бұл тек біздің болжам. Жұмыстың практикалық құндылығы құрылған статистикалық модель болып саналады, онда көптеген параметр жиынтығының өзгергіштігі анықталған факторлардың аз мөлшері арқылы түсіндіріледі. Бұл ретте, қандай да бір фактордың маңыздылығы оның айнымалылардың жалпы дисперсиясындағы үлесінің мәні негізінде бағаланады. Орындалған зерттеу Қазақстан экономикасының аграрлық секторының ерекшелігін зерттеу бойынша өзекті ұсыныстарды әзірлеуге, объективті түсінуге мүмкіндік береді деп үміттенеміз.

Түйін сөздер: көпөлшемді статистикалық талдау, факторлық талдау, корреляциялық матрица, корреляция коэффициенті, дисперсия

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СТАТИСТИЧЕСКИЙ АНАЛИЗ ИЗМЕНЧИВОСТИ ДАННЫХ АГРАРНОГО СЕКТОРА ЭКОНОМИКИ КАЗАХСТАНА

Аннотация. В статье изучается изменчивость группы данных, сформированной из показателей аграрного сектора экономики Казахстана, с помощью одного из методов снижения размерности как факторный анализ. Проанализированы данные 1993–2018 гг., т.е. за 26 лет. К анализу были включены: а) три показателя ВВП - аграрного сектора экономики в целом и по отраслям растениеводства и животноводства; б) четырнадцать показателей урожайности и валового сбора урожая по видам сельскохозяйственных культур. Статистическая обработка исходных данных производилась с использованием пакета программ STATISTICA 10. Результаты статистической обработки первичных данных - показателей ВВП: а) колебания данных ВВП, оцениваемые коэффициентом вариации, находились в пределах 65-67%; б) по значениям парных коэффициентов корреляции (0,97…0,99) можно утверждать, что рассмотренные показатели ВВП являются взаимозависимыми переменными с тесной корреляционной связью. При интерпретации результатов факторного анализа использовалась один из важных показателей математической статистики, как дисперсия (средний квадрат отклонений), отражающая меру разброса данных вокруг средней арифметической. Выяснено, что почти 90% разброса переменных, оцениваемые их общей дисперсией – это следствие влияния трех выявленных факторов. Тесная корреляционная связь (коэффициенты корреляции от -0,72 до -0,96) с первым фактором у всей переменной группы «урожайность». Влияние первого фактора ощутимо и в отношении показателей ВВП, об этом можно судить по значениям коэффициентов корреляции: -0,85; -0,85; -0,85 Что касается показателей валового сбора урожая, то здесь ситуация неоднозначная: колебания валового сбора хлопка, сахарной свеклы и табака в большей степени продиктованы влиянием второго и третьего факторов (коэффициенты корреляции: -0,62; 0,73; -0,77). У такого важного показателя, как валовой сбор зерновых культур, коэффициент корреляции с первым фактором только -0,64. Первый фактор, объясняющий изменчивость основной части переменных, по нашему мнению, можно принять за «удельный вес» влияния природно-климатических условий. Другие выявленные факторы показывают уровень влияния иных (кроме природно-климатических условий) объективных причин, пока не поддающиеся логическому объяснению. То, что колебания показателей валового сбора хлопка, сахарной свеклы и табака в большей степени зависят от влияния второго и третьего факторов, мы уже знаем. По нашей версии, показатели валового сбора урожая указанных культур, в меньшей степени зависят от природно-климатических условий (т.е. от влияния первого фактора), поскольку эти культуры возделываются на орошаемых площадях. Что касается статистической зависимости между данными валового сбора зерновых культур и выявленными факторами (коэффициенты корреляции с первым фактором -0,71 и с третьим фактором -0,44), то попробуем высказать свои предположения. Показатель валового сбора зерновых культур включает в себя данные по сбору риса и бобовых культур, возделываемых на орошаемых площадях. При возможности анализа изменчивости валового сбора зерновых культур без учета данных по рису и бобовых культур, вероятно абсолютное преобладание влияния первого фактора. Но это только наши догадки. Практической ценностью работы является созданная статистическая модель, в которой изменчивость большого набора параметров объясняется небольшим количеством выявленных факторов. При этом значимость того или иного фактора оценивается значением его доли в общей дисперсии переменных. Выполненное исследование будет способствовать адекватному и объективному пониманию особенностей аграрного сектора экономики Казахстана, что крайне необходимо для выработки актуальных предложений по развитию отрасли.

Ключевые слова: многомерный статистический анализ, факторный анализ, корреляционная матрица, коэффициент корреляции, дисперсия.

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USE OF BUDGET FUNDS BY RUSSIAN ECONOMIC ENTITIES: ANALYSIS AND MONITORING CRITERIA

Abstract. Efficient utilization of the budget funds provided by the government for development is ensured by applying the result-driven program-based method of planning or budgeting. This method enables rational distribution of the available country's resources for solution of medium- and long-term problems related to economic, social, and environmental development in order to makes the most of the investments by implementing designated programs. Efficient use of budgetary funds is a successful tool of national development.

A number of designated national, federal, and departmental programs have been implemented at the federal level of the Russian Federation. A targeted federal investment program has been in operation.

Despite the number of the development programs, the federal designated programs are prioritized and take a central position in the general structure of the implemented programs. Their priority is defined by focusing on development of an integrated and comprehensive approach for elaboration of measures aimed at meeting the objectives and integration of the activities of universities, scientific organizations, and economic entities of the economic development sector.

The field of small and medium-sized entrepreneurship (SMSE) is prioritized upon implementing federal, national, and departmental designated programs. The Russian Federation field of small and medium-sized entrepreneurship is represented by legal entities and individual entrepreneurs grouped into three categories – micro, small, and medium.

Implementation of the national development programs facilitates increase of the financial standing level of the economic entity, which implements such programs. On the other hand, financial standing is an economic-activity indicator of the economic entities pertaining to various business areas as the financial standing level is representative of the financial resource capacity required for smooth operation and reasonable allocation of resources, as well as of the efficiency of resources utilization by an economic entity.

Key words: budget funds, monitoring, entrepreneurship, forecasting, development programs, smooth operating rhythm, comprehensive approach, social sector, financial resources, ecology, economics, efficiency.

Introduction. Nowadays financial analysis is a tool for managing the financial standings of economic entities. This analysis is based on review and evaluation of the efficiency in managing the financial resources of economic entities by calculating various parameters.

Financial analysis is used by economic entities themselves, external market entities in the course of implementing various transactions or providing third parties with information about the financial standing. As related to internal review, financial analysis is used to evaluate the company's financial standing; in case of budgeting and budget constraining, it is used for assessment of the anticipated and achieved goals.

Use of the principles and methods of financial analysis facilitates efficient implementation of development programs. Except for financial analysis, application of the budget expenses performance audit is caused by the current conditions of development of economic relations and the demand for sustainable and efficient use of resources.

Methods. A. General information. This research methodology is based on the general and special scientific methods. The analytical method is used herein to compile the tables and expose the key aspects of the performance audit. The logical framework approach and legal analysis were used for studying the

paper subject; the problems emerging in the course of a performance audit were studied within the scope of system analysis.

Russian and foreign scientists have an increased focus on the financial analysis issues [1,2]. The following persons study the performance audit of budget expenses: T. Voronchenko [3], M. Isaev and P. Paulov [4], E. Kolesnikova and E. Kostyuk [5], Yu. Kutyrev [6], T. Samarets, L. Usacheva, I. Voinov [7], A. Skifskaya, D. Mikhailov [8], A. Tkachev, E. Reshetnikova [9], and others [18-23].

B. Algorithm. This research paper includes, summarizes, and systematizes the performance audit substance, the criteria and methods used to assess efficiency of federal budget expenses, as well as organization of performance audits in the Russian Federation.

C. Flow chart. The efficient review method is based on the audit procedures ensuring monitoring of rational and efficient use of budget funds. Efficient use of budget funds facilitates development of both particular economic entities and the whole state, ensuring a successful financial result. Reasonable allocation of the resources possessed by our country will enable solution of medium- and long-term problems related to economic, social, and environmental development in order to makes the most of the investments by implementing designated programs.

The Accounts Chamber and supervision and accounts agencies of the entities are authorized to audit the efficiency of utilization of public funds. An audit consists of three stages: planning, implementation, and reporting. The planning stage includes setting of strategic and current goals and objectives, as well as identification of the problems to be addressed. Besides, the efficiency criteria of utilization of public funds are stated. At the auditing stage, auditors apply the recommended practices for auditing efficiency of actual utilization of public funds including the criteria necessary to determine the audit types and the items to be audited.

The audit result is a report with recommendations on elimination of the identified deficiencies.

Results. The Russian Federation allocates a fair amount of budget funds for development of small and medium enterprises. Large-scale application of the program-based method started in the form of implementing designated programs back in 2004, in the course of approving the Budgeting Reform Concept. Essentially, this method provides for waiving estimated funding and migration to project-based budgeting. The primary purpose of this method is improvement of social and economic development due to efficient use of the public funds.

The boom of program-based budgeting in the Russian Federation started in mid 2000 and extended until 2016. In 2017, the Russian Federation Government decided to scale up the federal special-purpose programs (see figure 1) [10,11].

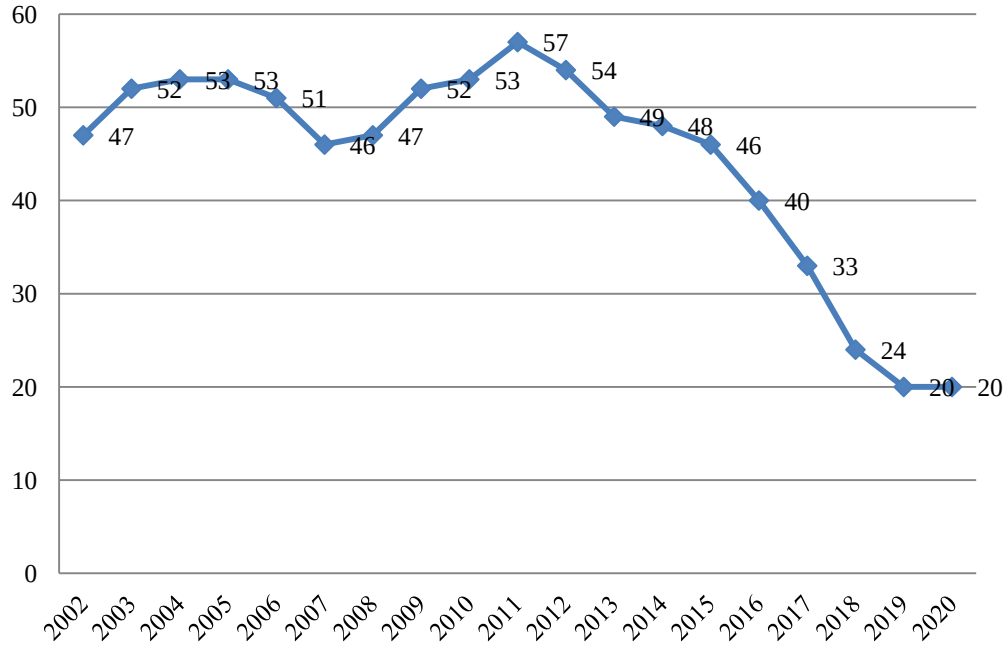

Figure 1 – Implementation dynamics of federal special-purpose programs for 2002 — 2020

According to the data provided, decrease of the number of implemented federal special-purpose programs (FSPP) is accompanied by decreased expenses on such programs (see figure 2) [10,11].

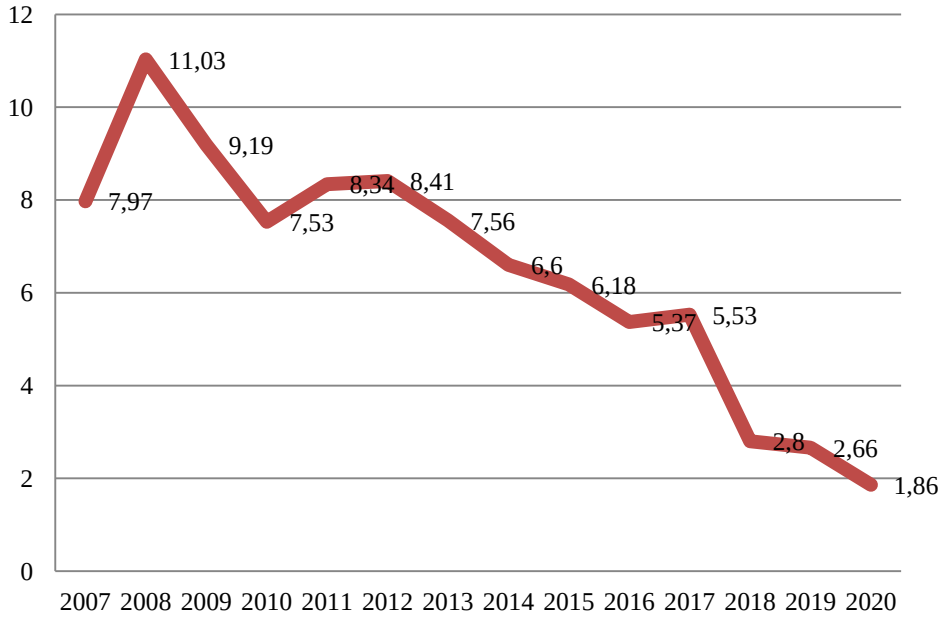

Figure 2 – Behavior of the Russian Federation budget expenditures for FSPP

The federal special-purpose programs for development of this country feature maximum expenses in 2008, which equaled 11.03 % of the federal expenditures for implementation of the programs. Yet the crisis of 2008 was the initial point in decreasing the level of prioritized spending of the budget funds. As of today and near term, decrease in the share of expenses for implementation of the federal special-purpose programs and shrinking of the resources for funding of projects in the overall volume of the budget funds.

N. Vasetskaya suggests identification of the causes for decrease in the share of expenses for implementation of FSPP in 2018 by evaluation of the FSPP financing structure with consideration of the priorities for the period of 2017 and 2018 (table) [1].

Priority areas as related to the extent of financing and share of expenditures for FSPP in 2017 and 2018

Item No.	Financing section	Extent of financing, RUB, bln		Share of expenditures in the extent of financing, %	
		2017	2018	2017	2018
1	Hi-tech development	199.7	199.0	22.01	42.51
2	Accommodation	50.1	–	5.52	–
3	Transportation infrastructure	362.3	–	39.92	–
4	Rural development	27.7	–	3.05	–
5	Social infrastructure	56.8	48.5	6.26	10.36
6	Safety	34.3	35.4	3.78	7.56
7	Regional development	161.4	170.1	17.79	36.34
8	Development of state institutions	15.2	15.1	1.67	3.23
9	Total	907.5	468.1	100.00	100.00

According to the table data, it is necessary to pay attention to the overall decreased extent of financing the federal special-purpose programs. The reduced extent of financing is due to the absent of such financing sections as accommodation, transportation infrastructure, and rural development in the structure of 2018. The Hi-Tech Development section is represented by 6 federal special-purpose

programs. A high level of research intensity is determined for the following programs: the Federal Space Program of Russia for 2016 – 2025 and the Federal Special-Purpose Program – Research and Development in the Prioritized Development Directions of the Russian Science and Technology sector for 2014 – 2020 [12].

Discussions. Considering the critical issues of the Russian Federation economic growth, it is necessary to pay attention to a surge of financial improprieties detrimental to the state. The statistical data related to improprieties over four years (2014 – 2018) are given in figure 3.

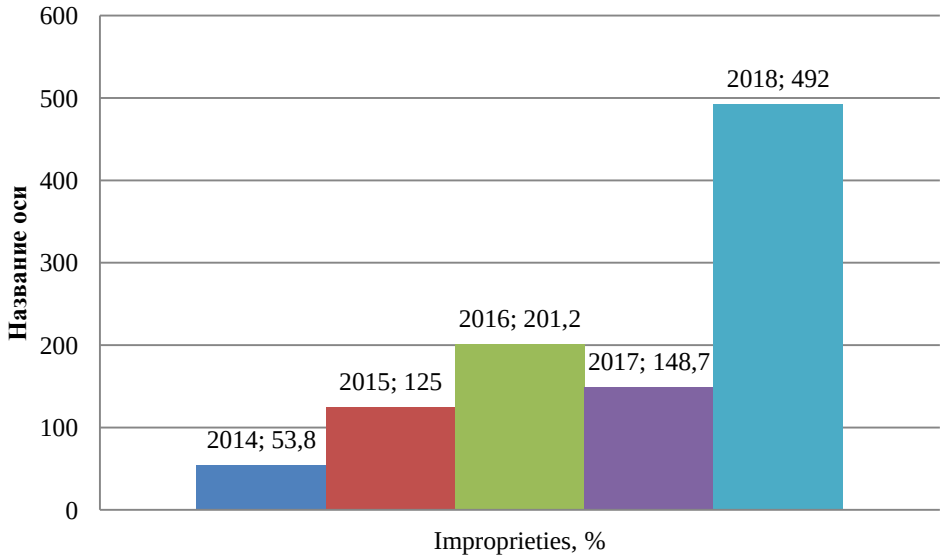

Figure 3 – Statistical data related to improprieties from 2014 to 2018

According to the carried out analysis and assessment of the improprieties, their rate of growth is 914.5 % since 2014. Though is it necessary to note volatility for the mentioned years. Thus, the growth rate of improprieties in 2015 was 232.3 % as compared to 2014, in 2016 — 160.96 % as compared to 2015. A lower number of improprieties is defined in 2017 — 73.91 %, yet a significant surge of improprieties is observed in 2018 — 330.9 % in relation to 2014.

The monetary evaluations of improprieties in 2018 is around 500 bln rubles, 33 bln rubles among them are declared inefficient expenditures.

Substantial financial losses necessitate development of a control environment to ensure security of the financial resources allocated to an economic entity by the state in the form of budgetary funds. In this case, an efficient tool will be an audit of budget funds utilization efficiency to outline the following:

- balance of budget payments;
- validity of budget funds utilization;
- efficiency of state budget expenses.

Legislatively, the budgeting efficiency principle is stated in Art. 34 of the Budget Code of the Russian Federation, "The principle of efficiency of budget funds utilization means that, in case of budget setting and utilization, the budgeting process participants must proceed, within their budgeting authorities, from the necessity to achieve the specified results using the lowest amount of funds (cost-effectiveness) and/or achieve the best results using the amount of funds established by the budget (performance) [13]."

According to the analysis results of financing implementation of the federal projects and the national entrepreneurship project, approximately 50 % of the federal budget funds provided by Federal Law No. 459-FZ for implementation of the national project in 2019 (considering the changes made to the consolidated budget breakdown) amounting to 26.86 bln rubles were spent on increasing access for business entities to financial resources. Among those funds, 9.7 bln rubles (36.1 %) were provided for establishing and/or development of microfinance organizations (MFO) in the constituent entities of the Russian Federation.

In order to elaborate the concept of MFO regional development, the Ministry of Economic Development of the Russian Federation awarded a state contract, dated August 27, 2019, for performance

of research work for the subject Diagnostics of the System of Established Microfinance Organizations and Development of the Concept of Further Development of the System of Supporting Small and Medium-sized Entrepreneurship via Microfinance Organizations.

Besides, among the funds spent in 2019 on increasing access for business entities to financial resources, 6.9 bln rubles (25.7 %) were allocated for state support of Russian lending institutions in order to compensate their lost incomes related to the loans granted to business entities in 2017, 2018, and 2019.

According to the results of selecting the authorized banks in the first half of 2019, 91 lending institutions were added to the list of authorized banks, and the total value of the granted preferential loans amounted to 334 bln rubles. As of November 1, 2019, business entities received 131.3 bln rubles under the subsidy program of the authorized banks or 13.13 % of the loan value specified in the data sheet of the federal project Financial Support of SMSE for 2019 in the amount of at least 1 trillion rubles. Thus, the subsidy program does not address the issue of increasing the volume of preferential lending of business entities to the full extent.

It is important to notice that such parameter as the volume of received loans is not deterministic in estimating efficiency of a program aimed at increasing the volume of preferential loans for business entities. This parameter also depends on the number of loan applications of business entities and their conformance to the stated criteria. In the context of deceleration in economic growth, business entities do not resort to loans at all.

Besides, a lending tool for small production business with the actual interest rate of 6.5 %, which was stated as necessary and accessible in the Address of the President of the Russian Federation to the Federal Assembly on May 1, 2018, has not been developed.

There is a problem in managing the national entrepreneurship project, which is reflected in the fact that subsidy recipients are not responsible for reaching the national project targets (the number of persons involved in SMSE, SMSE share in GDP, the share of SMSE entities in non-resource exports) and those responsible for reaching such targets do not affect distribution of funds and, as a rule, have no information about the recipients' activity.

For instance, it is planned to allocate over 260 bln rubles or 63 % of the federal budget funds provided for implementation of the SMSE national project to JSC Korporatsiya MSP, JSC Bank MSP, Russian lending organizations, FSBI Fund for the Promotion of the Development of Small Forms of Enterprises in the Scientific and Technical Sphere, and other legal entities in 2019 — 2024.

Besides, regional governors have the primary responsibility for the economic growth of the constituent entities of the Russian Federation.

According to Edict No. 193 of the President of the Russian Federation dated April 25, 2019, a key performance indicator of senior government officials (heads of supreme government organs) of the constituent entities of the Russian Federation is the number of persons involved in SMSE including individual entrepreneurs. At the same time, the mentioned government officials have no influence on the SMSE development measures implemented by the legal entities stated above.

Thus, a contradiction occurs: some persons receive funds, but other persons are responsible for meeting the national project objectives.

Conclusion. Finalizing the article, it should be noted that performed analysis made it clear that the measures/results of the national entrepreneurship project and included federal projects mainly have an indirect or supportive effect on reaching the national objectives. Results that may have a direct influence on reaching the national objective have been identified, in particular, "Acceleration of technological development of the Russian Federation, increase of the number of organizations implementing technology innovations up to 50 %." Besides, it is impossible to estimate the influence degree as the calculation methods and procedures for assessment of such influence are unavailable.

Comparative analysis of the target implementation indicators and the target parameters of the national project revealed absence of correlation between reaching the specified values of those indicators and parameters, which hinders evaluation of the influence of the measures under the national entrepreneurship project on reaching the key indicators of the Strategy.

At present, the practice of holding performance audits of budget funds utilization is irregular. The reason is that the state financial supervision bodies focus on prevention and interruption of budget funds misuse and corrupt practices when analyzing budgeting; thus, the matter of efficiency goes into the background. The major challenge of implementing performance audits is that the audit criteria should be

developed according to the set objectives and goals and revised promptly to be appropriate for the changed situation. To do this, auditors should conduct a research in order to define particular criteria to be used for assessment of the auditee's activity. Considering the long-term development of the real economy sector, forecasting of the financial standing perspectives of business entities, significantly different in the types of economic activities, is of paramount importance.

The dynamic character of the performance audit itself assumes that is must be constantly adapted to the changes taking place. The lifetime of any performance audit is limited as even the best performance audit loses its efficiency in a while.

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РЕСЕЙ ЭКОНОМИКАЛЫҚ СУБЪЕКТІЛЕРІНІҢ БЮДЖЕТ ҚАРАЖАТЫН ПАЙДАЛАНУЫ: ТАЛДАУ ЖӘНЕ БАҚЫЛАУ КРИТЕРИЙЛЕРІ

Аннотация. Дамыту үшін мемлекет беретін бюджет қаражатын тиімді пайдалану нәтижеге бағытталған жоспарлаудың немесе бюджеттің бағдарламалық-мақсатты әдісін қолдану арқылы қамтамасыз етіледі. Аталған әдіс мақсатты бағдарламаларды іске асыру арқылы инвестициялардың кірісін барынша арттыру үшін экономикалық, әлеуметтік және экологиялық дамудың орта мерзімді және ұзақ мерзімді мәселелерін шешу үшін елдің қолда бар ресурстарын ұтымды бөлуге мүмкіндік береді. Бюджет қаражатын тиімді пайдалану – мемлекет дамуының тиімді құралдарының бірі.

Ресей Федерациясының федералды деңгейінде бірқатар мемлекеттік, федералды және ведомстволық мақсатты бағдарламалар жүзеге асырылуда. Федералды мақсатты инвестициялық бағдарлама жұмыс істейді.

Көптеген даму бағдарламаларына қарамастан, федералды мақсатты бағдарламаларға басымдық беріледі және жүзеге асырылатын бағдарламалардың жалпы құрылымында орталық орын алады. Олардың басымдық фактісі университет, ғылыми ұйым және экономикалық даму секторы бизнес-құрылымдарының қызметін біріктіре отырып, мақсаттарға жетуге бағытталған іс-шараларды қалыптастыруға кешенді және жүйелі көзқарасты шешуге бағытталғандығына байланысты.

Шағын және орта кәсіпкерлік салада федералды мемлекеттік және ведомстволық мақсатты бағдарламаларды жүзеге асыруда басымдық сақталады. Ресей Федерациясында шағын және орта кәсіпкерлік саласын заңды тұлғалар (микро, шағын және орта кәсіпорындар), сондай-ақ жеке кәсіпкерлер микро, шағын және орта бизнес болып үш санатқа топтастырылған.

Дамытудың мемлекеттік бағдарламаларын іске асыру оны орындайтын шаруашылық жүргізуші субъектінің қаржылық жағдайының деңгейін жоғарылатуға септеседі. Өз кезегінде қаржылық жағдай – шаруашылық жүргізудің түрлі саласындағы шаруашылық жүргізуші субъектінің экономикалық белсенділігінің көрсеткіші, өйткені қаржылық жағдай деңгейі ырғақты жұмыс істеуге және мақсатты орналастыруға, экономикалық субъектінің оларды пайдалану тиімділігіне қажетті қаржы ресурсын сипаттайды. Шаруашылық жүргізуші субъектілердің төлемді уақтылы жүргізуге, экономикалық қызметті қаржыландыруға қабілеттілігі осы субъектінің қаржылық жағдайының жақсы екендігін көрсетеді. Қазіргі экономикалық, әлеуметтік және экологиялық ортадағы турбуленттік құбылыстар шаруашылық жүргізуші субъектіні және оның қаржылық ресурстарын тиімді басқару қажеттілігінің, сондай-ақ бақылау және қаржылық болжау қажеттілігінің маңыздылығын анықтайды және дәлелдейді.

Түйін сөздер: бюджеттік қаражат, бақылау, кәсіпкерлік, болжау, даму бағдарламалары, ырғақты жұмыс, жүйелік тәсіл, әлеуметтік сала, қаржылық ресурс, экология, экономика, тиімділік.

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ИСПОЛЬЗОВАНИЕ БЮДЖЕТНЫХ СРЕДСТВ РОССИЙСКИМИ ЭКОНОМИЧЕСКИМИ СУБЪЕКТАМИ: КРИТЕРИИ АНАЛИЗА И КОНТРОЛЯ

Аннотация. Эффективное использование бюджетных средств, представленных государством на развитие, обеспечивается применением программно-целевого метода планирования или бюджетирования, ориентированного на результат. Данный метод позволяет рационально распределить имеющиеся ресурсы страны на решение среднесрочных и долгосрочных проблем экономического, социального и экологического развития с целью получения максимальной отдачи от вложений посредством реализации целевых программ. Эффективное использование бюджетных средств – это один из результативных инструментов развития государства.

На федеральном уровне Российской Федерации реализуется ряд целевых государственных, федеральных и ведомственных целевых программ. Работает федеральная адресная инвестиционная программа.

Несмотря на многочисленность программ развития приоритетность отдается федеральным целевым программам и в общей структуре реализуемых программ они занимают центральное место. Факт их приоритетности обусловлен их направленностью в части решения комплексного и системного подхода формирования мероприятий сосредоточенных на достижение целей, интеграцию деятельности университетов, научных организаций и субъектов хозяйствования экономического сектора развития.

Предпочтение при реализации федеральных государственных и ведомственных целевых программ остаётся сфере малого и среднего предпринимательства. В Российской Федерации сфера малого и среднего предпринимательства представлена юридическими лицами (микро-, малыми и средними предприятиями), а также индивидуальными предпринимателями, которые группируются по трём категориям: микро-, малые и средние.

Реализация государственных программ развития способствует повышению уровня финансового состояния субъекта хозяйствования, реализующего эти программы. В свою очередь, финансовое состояние – это индикатор хозяйственной деятельности экономических субъектов различных сфер бизнеса, т.к. уровень финансового состояния характеризует обеспеченность финансовыми ресурсами, необходимыми для ритмичного функционирования и целесообразности их размещения, эффективность их использования экономическим субъектом. Способность экономических субъектов своевременно производить платежи, финансировать хозяйственную деятельность свидетельствует о хорошем финансовом состоянии данного субъекта. Современные турбулентные явления в экономической, социальной и экологической среде обуславливают и подтверждают актуальность необходимости эффективного управления экономическим субъектом и его финансовыми ресурсами, а также за контролем и финансовым прогнозированием.

Ключевые слова: бюджетные средства, контроль, предпринимательство, прогнозирование, программы развития, ритмичность функционирования, системный подход, социальная сфера, финансовые ресурсы, экология, экономика, эффективность.

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ASSESSING INVESTMENT ATTRACTIVENESS THROUGH SUSTAINABILITY CRITERIA IN TURBULENT ECONOMY

Abstract. Driven by various economic forces, modern society develops rapidly. Millions of investment projects are implemented annually in all sectors of the economy, costing billions of dollars. Facing the unstable macroeconomic environment, Russia is more than ever concerned about effective investment management.

Unfortunately, most investment strategies in Russia are implemented without properly assessing the investment attractiveness. Occasional investments cannot ensure the required long-term investment returns, which is one of the key performance indicators.

Business viability in the medium and long run will be jeopardized if the management lacks the skill and competency to assess the investment attractiveness of its investees. Nonproductive investments would deteriorate the entity's financial situation and affect its credibility with its shareholders and investors.

It should be noted that sustainability analysis is a complex and comprehensive process. Each entity operates in a specific environment, which is subject to constant changes, both positive and negative.

It is safe to say that positive changes, e.g. transitions and improvements in the social or environmental sphere, entail entity evolution due to the increased demand for its products and services.

From the point of view of economic feasibility, an entity is aimed at deriving profit for itself and generating income for its shareholders. Surely, shareholders want the entity to be stable or even increasingly stable, thus, determining the need for its sustainable development.

The relevance of the issues raised in this paper is explained by the importance of assessing the investment attractiveness of investees to effectively expand and adjust the entity's product portfolio and improve the competitive performance of the economy in general.

Key words: investment attractiveness, company, competitive performance, assessment, profit, sustainable development, funding, economy.

Introduction. First and foremost, the concept of investment attractiveness needs to be explained. Derived from the analysis of the entity's financial standing, this comprehensive indicator reflects the economic interests of the entity's investors.

To comply with today's requirements, many economic entities issue a Sustainability Report to disclose the economic, environmental and social aspects of their business. By conducting their business in accordance with the principles of sustainable development, entities can timely identify and mitigate risks, thus, strengthening their reputation.

Materials and Methods. A. General

Sustainable development of economic entities in various sectors of the economy occupies a central place among many other topics reviewed in scientific journals. Many foreign (W. Isard, D. Meadows, V. Pareto, J. Stiglitz, and others) and Russian scholars (M.M. Basova [1], L.F. Berdnikova [2], E.B. Vokina [2], O.V. Efimova [1], E.V. Nikiforova [1,2,3], I.G. Ushanov [1], O.V. Shnaider [1,4] and others [14-19]) focus on the important issues of sustainable development.

The issue of increasing investment attractiveness has been studied by V.M. Bautina, N.A. Zakharova, A.I. Kostyaeva, S.M. Markova, A.A. Chechenova, A.A. Chernyaev, and others.

B. Algorithm. This article gives a summary description of investment attractiveness and classification of specific features that make an entity attractive for investors, based on key sustainability performance indicators. It is a common fact that both sustainable development and financial sustainability aim at bringing an entity to a financially stable position. To decide whether an entity is financially stable or not, certain key indicators should be considered, namely: assessing the excess of income over expenditure, availability of reliable information about the free cash flows, line balance, and product sales. If an entity can steadily increase its profit and capital and maintain its solvency and creditworthiness over several years, it's safe to say that the entity's financial situation is stable.

C. Flow Chart. Sustainable development is understood as such development, where a balance is maintained between the exploitation of natural resources, investments, scientific and technological development, personnel development and institutional changes, to ensure the well-being of the current generation and improve the living conditions for the future ones.

In the 1970s, the approach to socio-economic development became increasingly environmentally conscious and resulted in the development of the concept of sustainable development.

To implement a sustainable development strategy in an entity, it is necessary to:

- set the long-term goals for the environmental, social and economic spheres;
- develop a detailed plan of actions by identifying the practical priorities;
- identify effective management tools to demonstrate the entity's transparency to key stakeholders.

A sustainable development strategy is developed in stages. Each stage is aimed at solving a specific task, such as risk identification, development of short-, medium- and long-term strategies, phased implementation in business processes.

Result. Assessing investment attractiveness through sustainability criteria in a turbulent economy is an important and responsible topic, highly relevant for many economic entities. Sustainable development indicators provide a comprehensive picture of the entity's overall performance and ensure financial reliability in making business decisions.

An index is an aggregated or weighted indicator, which is based on several other indicators or data [5]. Sustainability indicators are summarized in table. The list of indicators can be adjusted taking into account the specific goals and objectives set before an economic entity.

Sustainability Indicators

No.	Group of Indicators	Sustainability Indicators
1	Economic	Sector share in GDP
		Economic growth rate
		Fixed investment
		Fiscal capacity
		Involvement in foreign trade
		Environmental investment
		Innovation performance indicators
		Improved scientific and technical potential
		Reduction in crime rate
		Investment in employees' health and wellbeing
2	Social	Average annual wage
		Gini coefficient (income inequality index)
		Staff turnover growth rate
		Staff satisfaction with working conditions
		Availability of social security benefits
		Occupational disease rate
		Employees' education level
		Staff housing ratio

Table continuation

3	Environmental	Share of waste
		Share of air pollution
		Share of pollution of rivers and reservoirs
		Share of soil pollution
		Specific consumption of natural resources
		Share of renewal of natural resources
		Ecological Footprint Index
		Environmental investment
		Area of land with a high technogenic load
		Share of waste recycling
4	Institutional	Level of scientific development
		Application of international legal instruments
		Communication with the public
		Consideration of environmental and development issues in planning and managing activities to ensure sustainable development
		Legal mechanisms for cooperation to create the potential for sustainable development of the territorial entity
		Improving local legal mechanisms
		Availability of information for decision making
		Preparing for possible natural/technological crises
		Strengthening the role of major population groups
5	Integral indicators	Adjusted net savings
		System for Integrated Environmental and Economic Accounting
		Human Development Index
		Living Planet Index
		Ecological Footprint

The above groups of sustainability indicators expand the informational aspects of the entity's activities to enable its stakeholders to make effective investment-related business decisions. Business decisions are primarily aimed at generating profit for the stakeholders. It is beyond doubt that effective investment raising contributes to the sustainable development of economic entities.

Discussion. The polemical nature of sustainable development explains the requirement to review and summarize the definitions reflecting the sustainable development of economic entities.

Thus, E.N. Kucherova sees this concept as "a continuous balanced development of the company sustainability criteria, which can withstand the entropy trends, while sustaining their own values and basic properties" [6].

Several authors mention "continuity" as one of the main properties of sustainable development, and "qualitative and quantitative growth" as the goal of sustainable development.

M.V. Ivashin and S.A. Soroka define sustainable development with reference to both external and internal factors. They emphasize that "by seeking sustainable development, the company does not lose its potential, but maintains the growth rate, while efficiently using its resources" [7]. The uniqueness of their interpretation also lies in the fact that the authors "highlight" not only the current state of the enterprise but also the requirement to maintain the same criteria in the future.

Undoubtedly, sustainable development is important for economic entities and should be properly defined. The World Commission on Environment and Development defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [8].

A.S. Kutova believes that "for economic entities, the concept of "sustainable development" can be understood not only as a commitment to growth but also as self-preservation, as the case may be" [9].

E.V. Nikiforova and others believe that "the concept of sustainable development recognizes the equal influence of financial and non-financial indicators on the entity's financial and economic activities" [10].

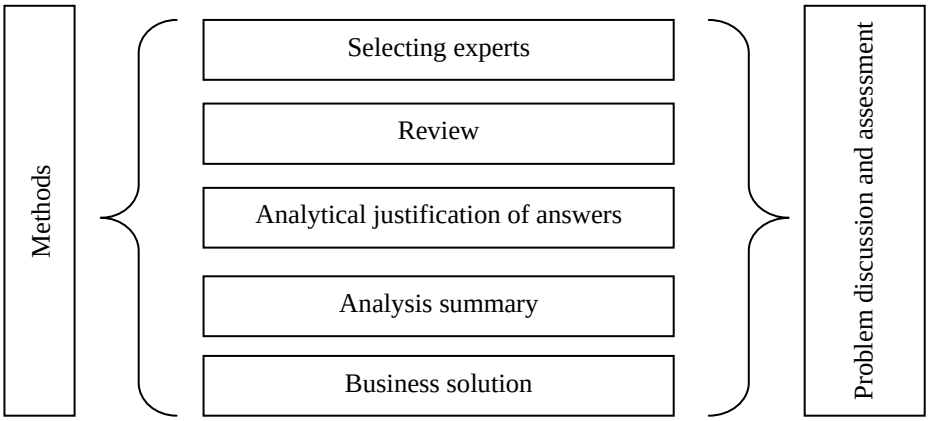
"In today's unstable economic, political and social environment, economic entities have to deal with many difficulties" [1]. Based on the specific challenges faced, each entity develops its own medium-term and long-term development strategy, which, in turn, is impossible without attracting investments.

Methods and criteria for assessing the investment attractiveness of an economic entity allow investors to form an opinion about the acceptability or unacceptability of the entity as an investee.

The first method for assessing the investment attractiveness of a company is the Delphi technique, which is based on expert judgment.

The Delphi technique includes 5 steps, as shown in figure 1.

Figure 1 – Steps of the Delphi technique



The second method for assessing the investment attractiveness of an entity is the discounted cash flow method (figure 2). This method is always based on the judgmental forecast of the company's future profitability [11].

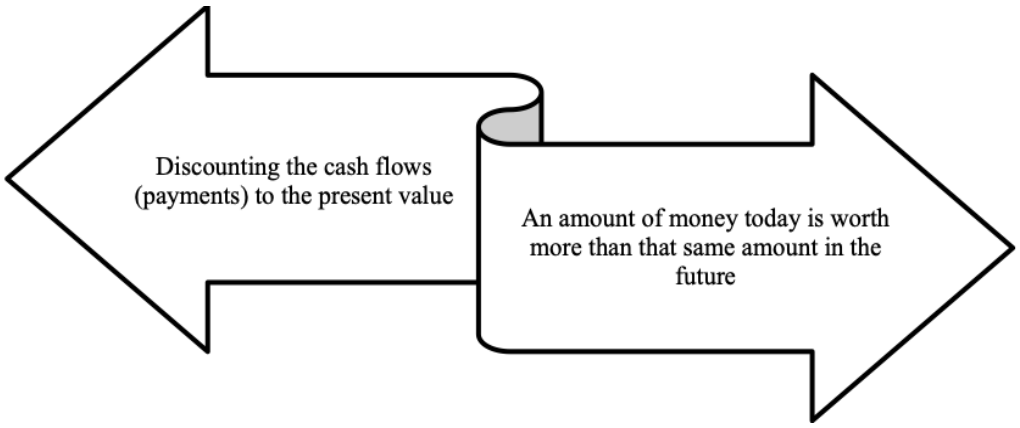


Figure 2 – Specifics of the discounted cash flow method

The advantage of this method is the ability to compare the financial expectations that the investors may have from investing in a company and the mathematically justified results, which are as close to reality as possible.

However, the disadvantage of this method is the impossibility to accurately forecast the future market situation and to adjust the computations to the expected income.

The third method for assessing the investment attractiveness of a company is an integral estimation. This method is based on dividing the company's KPIs into five categories (figure 3).

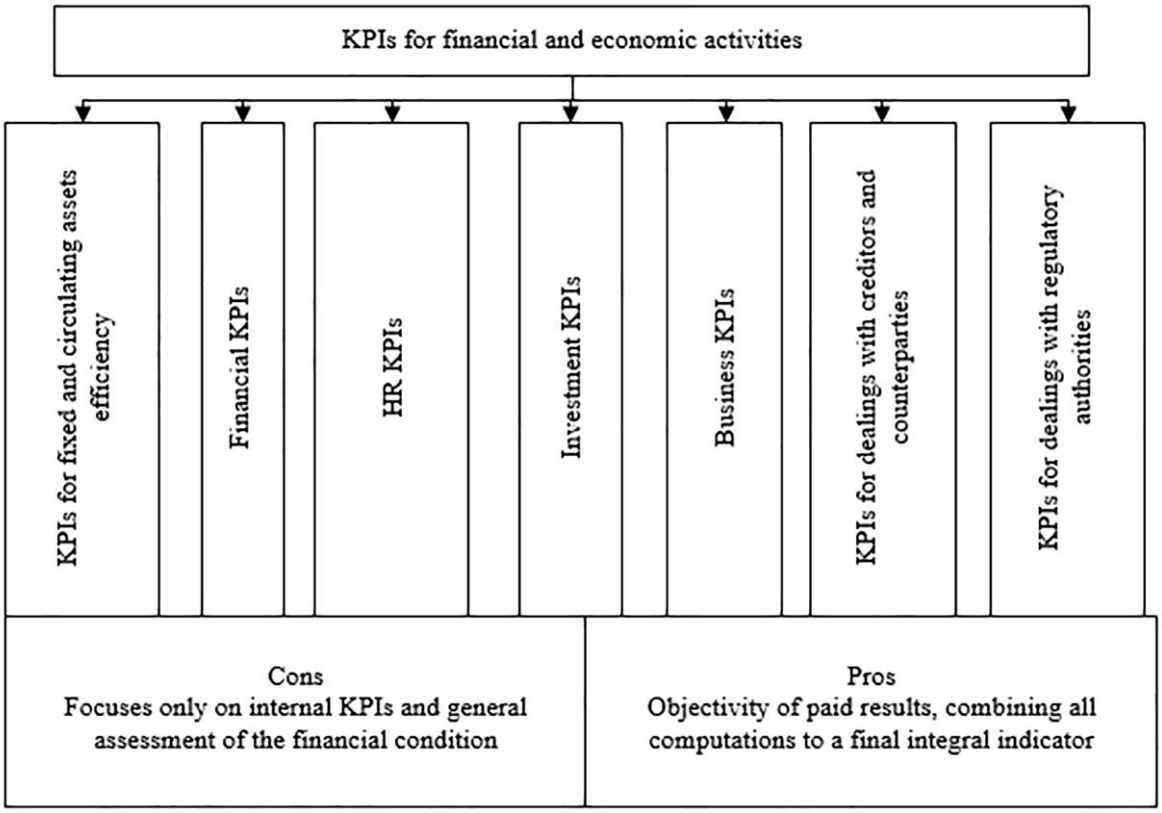


Figure 3 – Assessing the investment attractiveness of an economic entity through an integral estimation of internal KPIs

The advantage of this method is the ability to structure the information necessary for making a decision. There is also a minus here: the classification of indicators into specific groups may differ depending on the company and the industry sector.

The next step is to review specific indicators to assess the entity's sustainable development and investment attractiveness for key stakeholder groups.

Next, the amount of investment in the infrastructure of the Russian Federation will be analyzed, by areas of activity and their investment attractiveness, to predict the sustainability of economic entities in various groups (see figure 4).

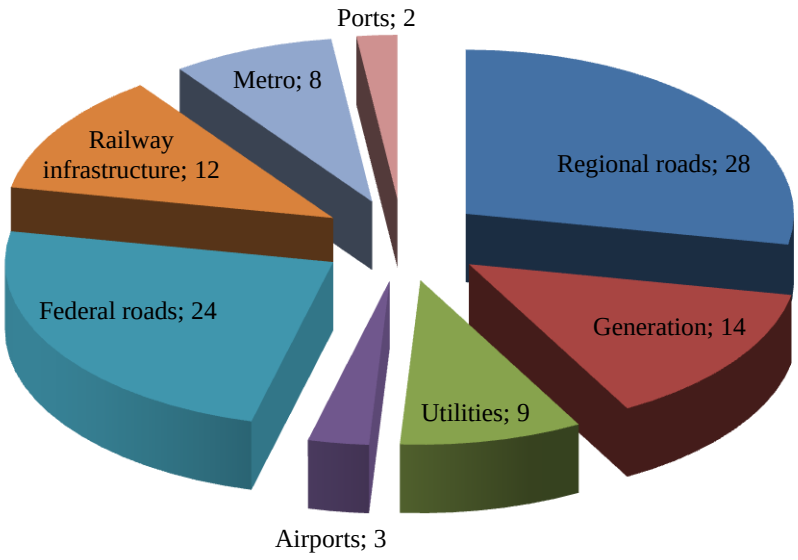


Figure 4 – Structure of investments in the Russian Federation

Based on the above review, a conclusion can be drawn that investments in the major sectors of the national economy will ensure the development of economic entities operating in such sectors. Investments can be disbursed in the short and medium term.

Conclusion. In conclusion, it should be noted that information on sustainable development is aimed at developing a long-term strategy for the economic entity. For each economic entity, the development and implementation of a sustainable development strategy is a fundamental condition for sustaining its business in the future. Comprehensive measures that take into account the impact of the external and internal factors and the investment attractiveness contribute to effective decision making. However, the effectiveness of management decisions depends largely on the reliability of the financial and non-financial information obtained through sustainability performance indicators.

In turn, accounting (financial) statements form the basis for analyzing and assessing the sustainable development of business entities. Such statements contain a list of main accounts, based on which the necessary indicators are calculated, reflecting the financial condition of the business entity. Based on the data obtained, the risk areas and the risks themselves may be determined, and methods for their prevention may be developed, which in turn correlate with the sustainability report. The sustainability report contains additional non-financial data while ensuring a reliable assessment of the financial and economic activities of the economic entity. Therefore, in a turbulent economy, investment attractiveness of economic entities can be assessed through sustainability criteria, provided that reliable financial and non-financial information is obtained in a timely manner.

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ТУРБУЛЕНТТІК ЭКОНОМИКАДАҒЫ ТҰРАҚТЫЛЫҚ ӨЛШЕМДЕР АРҚЫЛЫ ИНВЕСТИЦИЯЛЫҚ ТАРТЫМДЫЛЫҚТЫ БАҒАЛАУ

Аннотация. Әртүрлі экономикалық күштердің ықпалы негізінде қазіргі қоғам қарқынды дамуда. Жыл сайын экономиканың барлық саласында миллиардтаған доллар тұратын миллиондаған инвестициялық жобалар жүзеге асырылады. Макроэкономикалық тұрақсыз жағдайға ұшыраған Ресей инвестицияны тиімді басқаруға әрқашан мүдделі.

Өкінішке қарай, Ресейдегі көптеген инвестициялық стратегиялар инвестициялық тартымдылықты дұрыс бағаламай жүзеге асырылады. Кездейсоқ инвестициялар қажетті ұзақ мерзімді инвестициялық кірісті қамтамасыз ете алмайды және бұл – тиімділіктің негізгі көрсеткішінің бірі.

Егер басшылық өз инвестициясының инвестициялық тартымдылығын бағалау үшін дағды мен құзыретті меңгермесе, орташа және ұзақ мерзімді бизнес өміршеңдігі бұзылады. Өнімсіз инвестициялар кәсіпорын қаржылық жағдайын нашарлатып, акционерлер мен инвесторларға деген сенімін төмендетуі мүмкін.

Тұрақтылықты талдау күрделі және жан-жақты үдеріс екендігін де айтып өткен жөн. Әрбір субъект тұрақты оң және теріс өзгеріске ұшырайтын белгілі бір ортада жұмыс істейді.

Әлеуметтік немесе экологиялық саладағы ауысу мен жақсарту жұмыстары сияқты оң өзгерістер ұйымның өз өнімі мен қызметіне деген сұраныстың артуына байланысты эволюция тудырады деп сенімді айтуға болады.

Экономикалық мақсат тұрғысынан кәсіпорын өзі үшін пайда табуға және акционерлеріне кіріс алуға бағытталған. Әрине, акционерлер ұйымның аса тұрақты болғанын тілейді әрі тұрақты даму қажеттілігін анықтайды.

Осы құжатта көтерілген мәселелердің өзектілігі кәсіпорынның өнім портфелін тиімді кеңейту және реттеу, тұтастай экономиканың бәсекеге қабілеттілігін арттыру үшін инвестициялық объектілердің инвестициялық тартымдылығын бағалаудың маңыздылығы негізінде түсіндіріледі.

Әрбір әлеуетті инвестор инвестициялық климат туралы жеткілікті ақпарат болса, үздік инвестициялық жағдайы бар аймақты таңдай алады. Шешім қабылдау үшін инвестор әдетте инвестициялық тартымдылық дәрежесі мен тәуекел деңгейін бағалауы керек. Аймақтарды инвестициялық тартымдылық негізінде бөлу өңірлік саясаттың негізгі қағидаттарын неғұрлым нақты тұжырым жасауға, сондай-ақ аймақтық билік органдарын инвестициялық климатты жақсарту үшін жігерлі әрекеттерге ынталандыруға мүмкіндік береді.

Ресей Федерациясының құрылтай субъектілерінің инвестициялық тартымдылығын талдау аймақтардың инвестициялық мүмкіндіктері (потенциалы) түрлі екенін және оларда түрлі қауіп факторлары жұмыс істейтіндігін көрсетті. Инвестициялық үдерістерді зерттеуге көптеген экономистер мен сарапшылар қатысады. Қосымша инвестициялар кез-келген салаға керек. Жаңа кәсіп ашуға, қала құрушы кәсіпорынды, жеке аймақты немесе тұтастай елді қолдауға инвестор тартса да, тартпаса да қажеттілік танытады.

Түйін сөздер: инвестициялық тартымдылық, компания, бәсекеге қабілеттілік, бағалау, пайда, тұрақты даму, қаржыландыру, экономика.

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ОЦЕНКА ИНВЕСТИЦИОННОЙ ПРИВЛЕКАТЕЛЬНОСТИ ЧЕРЕЗ КРИТЕРИИ УСТОЙЧИВОСТИ В ТУРБУЛЕНТНОЙ ЭКОНОМИКЕ

Аннотация. Современное общество, движимое различными экономическими силами, быстро развивается. Миллионы инвестиционных проектов осуществляются ежегодно во всех секторах экономики, стоимостью миллиарды долларов. В условиях нестабильной макроэкономической ситуации Россия как никогда обеспокоена эффективным управлением инвестициями.

К сожалению, большинство инвестиционных стратегий в России реализуются без должной оценки инвестиционной привлекательности. Случайные инвестиции не могут обеспечить требуемую отдачу от долгосрочных инвестиций, что является одним из ключевых показателей эффективности.

Жизнеспособность бизнеса в среднесрочной и долгосрочной перспективе будет поставлена под угрозу, если руководству не хватает навыков и компетенции для оценки инвестиционной привлекательности своих объектов инвестиций. Непродуктивные инвестиции могут ухудшить финансовое положение предприятия и повлиять на его доверие к акционерам и инвесторам.

Следует отметить, что анализ устойчивости является сложным и всеобъемлющим процессом. Каждый субъект действует в определенной среде, которая подвержена постоянным изменениям как положительным, так и отрицательным.

Можно с уверенностью сказать, что позитивные изменения, например, переходы и улучшения в социальной или экологической сфере влекут за собой эволюцию организации в связи с повышенным спросом на ее продукты и услуги.

С точки зрения экономической целесообразности предприятие нацелено на получение прибыли для себя и получение дохода для своих акционеров. Конечно, акционеры хотят, чтобы предприятие было стабильным или даже становилось все более стабильным, что определяет необходимость его устойчивого развития.

Актуальность вопросов, затронутых в этом документе, объясняется важностью оценки инвестиционной привлекательности объектов инвестиций для эффективного расширения и корректировки портфеля продуктов предприятия и повышения конкурентоспособности экономики в целом.

Каждый потенциальный инвестор при наличии достаточной информации об инвестиционном климате может выбрать регион с наилучшими условиями инвестирования. Обычно инвестору для принятия решения необходимо иметь оценки степени инвестиционной привлекательности и уровня существующих рисков. Разделение регионов по признаку инвестиционной привлекательности позволяет более обоснованно сформулировать основные принципы региональной политики, а также стимулировать региональные власти к более энергичным действиям по улучшению инвестиционного климата. Анализ инвестиционной привлекательности субъектов РФ показал, что регионы обладают различными инвестиционными возможностями (потенциалами) и в них действуют разные факторы риска. Исследованием инвестиционных процессов занимается огромное количество экономистов и аналитиков. Дополнительные вложения требуются в любой отрасли, будь-то привлечение инвестора для открытия нового дела, поддержание градообразующего предприятия, отдельного региона или страны в целом.

Ключевые слова: инвестиционная привлекательность, компания, конкурентные результаты, оценка, прибыль, устойчивое развитие, финансирование, экономика.

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FOREIGN EXPERIENCE OF FINANCIAL, CREDIT AND INVESTMENT SUPPORT OF SMALL BUSINESS

The relevance of the research topic. The article deals with the question of studying the foreign experience of financial, credit and investment support for small businesses. The forms, types and methods of budget regulation are considered as components of the state support mechanism. The sources of state support for small business are characterized. A significant analysis of foreign experience in supporting small businesses has been made. The feasibility of implementing foreign experience in financial, credit and investment support of small business in Ukraine is substantiated. **Goal**. To study the foreign experience of financial-credit and investment support for small business, to substantiate the feasibility of implementation of foreign experience in the implementation of the financial mechanism of development of small business in the national economy. **Methods**. The methodological basis of the research is general scientific and special methods of scientific knowledge. Among them are the following: methods of analysis and synthesis, induction and deduction - to reveal approaches to forms, methods and sources of state support for small business, as well as to justify the cause and effect relationships and to determine the factors that influence the development of small business in current conditions; method of comparison – during the study of foreign experience of functioning of small business and the possibilities of its use in domestic practice. **Results**. Some aspects of the development of small business in France are analyzed by constantly improving the skills of managerial staff of small firms and creating legislative guarantees to prevent bankruptcy. The successful experience of economic growth through the development of small business in Asian countries is analyzed, which are developing, among which: Taiwan, Singapore, Indonesia. The experience of state support of small business in India through the development of export activities of small companies, the provision of tax and customs benefits, subsidies, lower rental rates and concessional financing is considered. The effectiveness of the experience of state regulation of small business in Japan is analyzed. The experience of the United States of America and Canada, which actively provide guarantees for loans to small businesses, is examined. In Germany, in turn, the state pays more than 50% of consultations to enterprises, and also provides annual soft loans for the modernization of production. An important role is played by the preferential tax and financial system. In the Czech Republic, the state in various forms provides comprehensive support to small enterprises to partially compensate for the lack of own funds, which is especially important at the initial stages of development, provides access to financial resources for small enterprises, stimulates the creation of new jobs, and supports export-oriented and innovative small enterprises. The main form of support for small businesses in the Czech Republic is the provision of financial support in the framework of targeted state programs.

Key words: entrepreneurship, business, small business, government support and regulation, financial, credit and investment support for small businesses.

Introduction. Different forms and methods of state influence on the development of small enterprises are used in the world economic practice. The presence of a large number of various forms of government support for small businesses makes it difficult to address the issues of choosing the most rational ones that require systematization. The problematic questions regarding the forms and methods of the state's influence on the development of small businesses should be that the same levers can provide different results both in different states and in one country at different stages of its development. The solution of problems related to the choice of the most rational forms and methods of influence of the state

on the development of small enterprises can be ensured by the adaptation of foreign experience to domestic realities. The positive global experience of small business development is a strong argument for its need for implementation in Ukraine.

Analysis of recent researches and publications. Problems of functioning of small business have been and remain the object of research of scientists from many countries of the world. The following classics of economic science have made a significant contribution to the development of small business theory:
R. Hilferding, P. Drucker, R. Cantillon, A. Marshall, J.-B. Sei, A. Smith, J. Schumpeter et al. The research of theoretical and practical problems of small business activity is devoted to the works of such foreign scientists: O. Anisimov, E. Buchwald, K. Bush, O. Vilensky, V. Gamza, O. Gorshenin, A. Kovalev, K. Kunze, M. Lapusta, O. Maliyeva and others.

After the declaration of independence of Ukraine, when the stage of becoming a legal field for doing business actually began, the interest of Ukrainian scientists to study the financial aspects of the functioning of small business increased. The leading Ukrainian scholars have devoted their work to this issue: V. Boronos, L. Buryak, Z. Varnalii, O. Vatamanyuk, L. Vorotina, S. Dryh, V. Zbarsky, E. Ionin, O. Kvasovsky, D. Knysh, O. Kovaluk, M. Krupka, O. Kunditsky, R. Larina, S. Lobozynskaya, V. Lyashenko, I. Mikhasyuk, Z. Pator-Vysotska, V. Plisa, J. Poplavskaya, S. Reverchuk, A. Khorozhiy, M. Huras and others.

Despite the considerable amount of research in this area, studies of the financial mechanism of small business development are poorly understood. Most often in the works of scientists are considered only some components of the financial mechanism, there is no comprehensive analysis. The challenges of identifying the relationship between small business financial indicators and micro, macroeconomic and institutional indicators remain unresolved. Foreign experience in the implementation of the financial mechanism of small business development and the prospects of its adaptation to domestic economic conditions require a thorough study. That is why the need for a thorough study of the theoretical foundations and applied aspects of the foreign experience of the financial mechanism for the development of small business has determined the relevance of the chosen topic.

The **purpose** of the article to study the foreign experience of financial-credit and investment support for small business, to substantiate the feasibility of implementation of foreign experience in the implementation of the financial mechanism of development of small business in the national economy.

Main results of the study. The following forms, types and methods of budgetary regulation, which differ in implementation methods and mechanisms, may be used as part of state support for small enterprises.

– free direct financing (budgetary allocations, subsidies, subsidies);

– loans and guarantees for preferential loans (direct budgetary loans and loans, unit participation and guarantees in commercial loans, compensation to commercial banks of interest on preferential loans, transfer of funds to banks for targeted lending, repayment of bank loans at the expense of budgetary funds, provision of state guarantees bank loans, etc.);

– state innovation and technological orders and purchases (orders of products, mainly innovative, purchases from agricultural producers of foodstuffs, ordering and purchase of technologies and scientific developments with their subsequent sale to large and medium-sized businesses);

– other forms, methods, tools and mechanisms.

Promoting the development of small business for the benefit of society and the state is considered the norm in the world practice. At the same time, the task of the state is not only to simply transfer small, financial, technical and other resources to small enterprises, but also to help them to survive on the basis of legal and economic basis, to create opportunities for growth and self-development in the market conditions. The incentive influence of the state should be oriented to the fact that small enterprises in various industries actively influence the process of demonopolisation of production, ensuring the saturation of domestic and foreign markets with new goods and services. Sources of state support for small business can be:

– funds from the Regional Enterprise Support Fund;

– funds of budgets of all levels planned for these purposes in the manner of implementation of joint projects of national and regional programs, relevant legislative and regulatory acts for the next budget period;

– part of the budget surplus funds and over-budgeted revenues;

– funds of banks, leasing companies, venture capital and other private funds, which are directed to lending and financing of small enterprises under state guarantees;

– funds of a mixed (public-private) venture capital firm [1].

Small business in developed countries embraces the middle class, which is the basis for the sustainable development of any country's economy. For example, the main influence on the development and promotion of small businesses by public authorities in France is focused on improving the qualifications of the management staff of small firms and creating legislative guarantees to prevent them from bankruptcy. In Spain, in the absence of own funds, the government provides financial assistance to small businesses. Developing Asian countries (Taiwan, Singapore, Indonesia) have made an economic leap and are among the most highly developed countries in recent years due to the rapid development of small businesses [2, p.30].

Singapore is ranked 5th in the world in small business development through tax relief (especially in the early years of business creation), a steady decline in interest rates on loans to small businesses, a large number of preferential lending programs, government funding for training and promotion. qualifications of workers employed in the field of small business. Thanks to this support, about 140,000 small and medium-sized enterprises operate in Singapore, representing 90% of all enterprises in the country that provide GDP growth of 5-6% per year [3].

In India, there are 3 million small businesses employing up to 80% of employees in the entire Indian industry. The main areas of activity of small businesses are farming, information and technology. An important role in the development of small business is played by state support, which is provided at the federal and regional levels, small business support programs are developed for 5-10 years by the Planning Commission of India, in which state support is to develop the export activity of small companies, providing tax and customs benefits, subsidies, reductions in rental rates and preferential financing [4].

In Japan, the share of small businesses is about 40%, operating in the construction, light industry and service sectors [4]. Small business development benefits depend on the status of the enterprise and the type of activity. State support for small businesses is to provide government subsidies and loans for business development. The state acts as a guarantor when receiving a loan from a bank, conducts training of specialists at the expense of state funds in specially created centers and free qualification consulting of entrepreneurs. Japanese law strictly regulates market value for all types of products; the government controls the unjustified increase in prices for raw materials, finished goods and services, which provides good conditions for small business development in the country. Based on existing legislation to support entrepreneurship in the country, 3 state financial funds have been created to provide financial support to small businesses: Central Cooperative Bank for Commercial and Industrial Enterprises, People's Corporation for Financing, State Corporation for Small Business Financing. Similar tasks are set by the State Corporation for Credit Insurance and Financing of Small Businesses, joint-stock companies for investment and development of small and medium-sized companies. Such measures of the state provide real support to small enterprises that do not have a high liquidity pledge to secure the received funds [4].

Japan's small businesses are assisted in obtaining government orders for the supply of goods and services, the share of which in the volume of government orders is 45%, in the volume of other enterprises and organizations – 32% [2, 4]. An analysis of small business support mechanisms in Japan shows that the greater the role of small business in economic life, the more diverse forms of support it has [2, p.32].

In the United States, small business development began during the Great Depression, in the face of declining production volumes, mass layoffs, and depreciation of the currency. Recognizing the importance of the development of small and medium-sized businesses for the economy of the country in the early 1950s, the government began to form a system of regulation and support for small businesses. In 1953, a specialized agency was created, the American Small Business Support Administration, which has provided technical and financial support to start-ups for many years. Within the administration, there are three different programs of crediting small business enterprises: replenishment of working capital,

purchase of land, property or equipment and micro-credit, where the administration acts as a guarantor before the bank from the state. Financial support for small businesses in the United States is provided primarily through grants, direct and guaranteed loans. US small business entities are able to obtain financial assistance at their state level [3].

In contrast to Japan and some European countries, Canada has in recent years abandoned the traditional subsidies used to support small businesses, since such programs have paralyzed the creative energy and initiative of business people who relied solely on state aid.

The Government of Canada pays special attention to the establishment of flexible small business services and the provision of support in the form of loan guarantees. The main source of funding is the commercial bank system. In addition, tools such as credit guarantees and preferential taxation are used to encourage small business investment in Canada.

Canadian economists have concluded that it is not enough to create macroeconomic conditions and levers to support small businesses. Three additional conditions are needed to create the conditions for small business, namely: an entrepreneurial culture based on an awareness of the importance of business for the prosperity of society; providing the necessary training programs; availability of financing [2, p.31].

In Germany, the policy of the state in support of small businesses is aimed at ensuring, through their development, the resolution of various problems of individual lands. The forms of government support for small German enterprises are quite diverse, in particular, the state pays considerable attention to support for small enterprises engaged in research, innovation through the financing of this type of work and the issuance of guaranteed loans. The state provides financial resources to commercial lending institutions that lend to small businesses in order to promote microfinance for small businesses. The KFW Group, which is 80% owned by the German Government, was created for this purpose [6].

Every year, large sums are allocated from the state budget to support small business in Germany. In addition, the state pays more than 50% of consultations to enterprises, as well as allocates annual preferential loans to modernize production from the Marshall Plan Fund [7]. An important role is played by preferential tax and financial system. In Germany, a non-taxable minimum income has been established, and a mechanism for paying income tax at a preferential rate (50%) has been developed and implemented, which is applicable in the event that the amount of profit determined by law is not exceeded [10, p.75].

In the Czech Republic, the state in various forms provides comprehensive support to small businesses to partially compensate for the lack of own funds, which is especially important in the initial stages of development, provides access to financial resources for small businesses, stimulates job creation, supports export-oriented and innovative small businesses. The main form of support for small Czech enterprises is the provision of financial support under targeted government programs, which are adopted annually by the Ministry of Industry and Trade, implemented by the Czech Moravian Guarantee and Development Bank. The legislation of the country provides for a wide range of forms of financial support for small businesses: guarantees for loans and leasing; preferential loans at low interest rates, financial subsidization of the interest rate on loans; grants for the creation of new jobs, including few protected sections of the population, interest-free loans to support the implementation of research and development; concessional loans for regional development projects in depressed regions with high unemployment; preferential lending and export insurance; the state system of investment incentives; assistance in obtaining advisory and information services; cooperation in participation in international exhibitions and fairs [11, p.217].

Spain's state policy for the development of small businesses is aimed at ensuring the competitiveness of domestic products in international markets, implemented by the Institute of Small and Medium Enterprises. In Spain, it is also practiced to assist entrepreneurs through mutual guarantee societies. Such partnerships are created at the expense of voluntary contributions from entrepreneurs and are designed to provide guarantees to banks for their members in obtaining loans for specific entrepreneurial projects, as well as to conduct expert evaluation of these projects to determine the level of their profitability. In order to encourage the development of mutual guarantee societies and increase their confidence in credit institutions, the Spanish Government has adopted a law regulating their activities and providing for certain guarantees and financial assistance from the state in case of lack of own funds. When more capital is accumulated, individual mutual guarantee companies are transformed into mutual finance companies, which under the law acquire the status of financial institutions and engage in direct lending to entrepreneurial projects [12, p. 21].

An effective support system for small business exists in the UK. The state is actively using fiscal, fiscal and credit policy instruments to stimulate this sector of the economy. Income tax rates are reduced for small businesses: at a standard rate of 35%, the rate for small businesses is 27%. Together with the reduction of the small business income tax rate, the tax on investments in new small businesses, especially those associated with high risk, has been reduced. In addition, the private initiative is stimulated by the provision of tax rebates, simplification of the financial procedure of mergers and divisions of firms, reduction of all rates of individual income tax, increase of the salary threshold, which is subject to tax at the highest rate [13, p.96].

In the UK, there is a network of advisory services, scientific and technical information and guidance on setting up and running a small business. These include the Small Business Service, local business agencies, job centers, community associations and initiative groups.

In Italy, a system of state financial support for small businesses has been developed through the subsidization and preferential lending to the activities of certain small business areas and the activities of consortia and cooperatives uniting small businesses. Preferential loans are granted for the implementation of new projects and the modernization of small businesses, at a rate almost twice lower than the market rate. Preferential taxation also applies to financial companies created to modernize small businesses. They are not subject to a 5% increase in their participation during each financial year. In addition to preferential taxation, the system of state support for small business in Italy also includes targeted subsidies and preferential lending [13, p.96].

It is practiced in Italy to provide preferential long-term loans at 3-5% per annum at a market interest rate of about 15%. In this case, enterprises can receive an additional tax benefit of 20-30% offsetting the cost of the loan with early repayment of the loan [14, p.7]

As the experience of developed countries shows, small business is successfully developing under the condition of constant and effective state support, in the conditions of optimal balance of development of big, medium and small business. In our country, small business has not yet been given due attention, in fact, has not developed a clear concept and comprehensively justified program of development of this form of business, and the system of financing and logistical support for the formation and development of small enterprises is imperfect. In many respects, the legal and organizational issues of micro-firm activity remain largely unworked.

To stimulate the development of small businesses in our country (no matter how well or poorly they are developing) requires effective and active support of public authorities, access to cheap credit resources, information and technical support for entrepreneurs at all stages of enterprise development. In foreign countries, small businesses are quite stable in development, earn significant profits and have the opportunity to compete in international markets for goods and services (this is especially noticeable in the US, China, and Asia). In Ukraine, small businesses are unprotected, very vulnerable to external economic factors, and virtually unable to market their products on the international market. As soon as some enterprises start to develop, increase production volumes, they are immediately transferred to the category of large enterprises that are not entitled to receive benefits in lending, taxation, licensing, etc.

Using the experience of foreign countries, immanent recommendations for Ukraine, which can be implemented both at the national level and with the participation of local governments, such measures to support small businesses: activation of preparatory and information events, advisory measures of general and innovative nature for entrepreneurs, promote the development of companies by improving the existing and introduction of a new technological process, product or service; support for technology parks and technology transfer centers; financial support for business projects (providing guarantees, loans); granting grants for large innovative investments; financing of training, postgraduate training for entrepreneurs and their employees; financing the development of scientific research with their further introduction into the real sector of small business, establishment of a system of academic entrepreneurship. Integrated implementation of these areas from the experience of supporting small businesses in other countries will help create a favorable environment for the development of small businesses in Ukraine, and an important factor of economic growth.

In addition, the experience of supporting small businesses in developed countries should be applied. For example, to envisage in the small business support system measures aimed at creating favorable conditions for start-ups in this sector as they do in the USA and maintaining these conditions at an

appropriate level for their development as foreseen in France. It is necessary to take into account the experience of Japan, which supports those sectors that are most promising for the country's development.

Thus, financial criteria for capitalization are modified to maximize capitalization «...in an absolute competitive market environment», which, in turn, causes the transformation of relevant mechanisms in enterprises and the transition from the financial and investment model, when the value of enterprises was determined based on expectations of income receivable, into a strategically oriented one, the peculiarity of which is intellectualization and digitization of capital formation processes. In a competitive environment, such objects as tangible forms of capital lose their priority, and intellectual and technological factors become the development keynote [16, p.137].

World experience shows that virtually all the leading countries that have achieved the highest GDP per capita have [15, p.34].

– an open market economy, free pricing, low customs barriers, a highly competitive market environment;

– the prevalence of private property while protecting it;

– effective tax administration, a tax system controlled by taxpayers through democratic institutions;

– effective governmental organizations with low levels of corruption;

– transparent public and financial institutions;

– democratic political system with high level of political competition, reliable mechanisms of control over the state and bureaucracy;

– law-abiding citizens, an independent judicial system trusted by citizens, a strong system of law enforcement and enforcement of judgments;

– minimal gap between formal and informal norms of social behavior.

The countries where these institutions operate effectively have a highly developed economy. The high economic growth rates demonstrated in the second half of the last century by EU countries, Japan, South Korea, new industrial countries in East Asia, modern China, India, and Brazil were achieved because state economic policies in these countries were aimed at supporting and stimulating scientific, technical processes with the further commercialization of their results by the entrepreneurship system both in the domestic and foreign markets. The experience of foreign countries demonstrates the importance of reorienting in the post-crisis period a government support mechanism to help businesses survive in difficult conditions to encourage them to modernize, including by easing restrictions on access to financial resources.

Undertaking an effective and efficient mechanism for shaping and implementing a state policy of small business support in Ukraine undoubtedly requires creative borrowing and use of world achievements in this field, first of all the experience of countries with developed market economies to ensure the sustainable development of small business as an integral market sector. economy and job creation. At the same time, foreign experience cannot be directly applied in the conditions of our country, since every state has its own peculiarities that influence the entrepreneurial culture, the attitude of society to entrepreneurs, the sectoral structure of the economy, etc. It is necessary to search your own solution to the problems with the economic realities of today and the specificity of the national mentality.

The need to support small businesses around the world is considered a responsibility of the state, because they are inferior to large enterprises in terms of modernization, marketing research, financial resources, and the competitiveness of goods and services [8, p.110].

At the same time, the study of foreign structures and mechanisms of state support would reveal the common features that exist in each country, despite the national characteristics [9]. 3 given the specific factors, they could to some extent be used in reforming the systems, forms and mechanisms of support and development of small and medium-sized enterprises in Ukraine, among them:

– availability of appropriate legal acts;

– rational distribution of functions between central, regional and local state authorities on small business support;

– formation and implementation of a comprehensive system of state and regional support programs;

– allocation of appropriations from budgets of different levels for the implementation of assistance programs for small business entities;

– a combination of direct and indirect small business support measures.

The main tools for such support should be:

– formation of an extensive network of state institutions supporting small and medium-sized businesses. One of the steps in this direction can be the creation of state-owned specialized funds for small business insurance against investment risks. An alternative solution to this task may be to establish agency relations with the most reliable insurance companies, which, under the government's guarantee, would assume the service of investment risks;

– establishment of agency relations with commercial banks that would monitor the competitiveness of small businesses and lend them under the government's guarantees for replenishment of working capital and implementation of investment projects;

– establishing flexible mechanisms for certification of products of small firms and the dissemination of information on world standards for certain products;

– connection of small and medium-sized enterprises to the execution of state orders, participation in the innovation process;

– providing consulting services on business strategy development;

– orientation of the state policy on motivation of joint activity, mutual assistance and cooperation within the small business sector;

– interaction of public authorities with public structures that express the interests of small businesses in the formulation and implementation of state policy in the field of small business;

– formation of an attractive image of an entrepreneur in society, tolerance of his temporary failures.

Examining the state of development of small businesses in some highly developed countries, we can distinguish some features:

1) the regulatory policy of the EU government aims at promoting and supporting the development of small businesses at the legislative and governmental levels;

2) entrepreneurship policy is aimed at stimulating innovative activity;

3) in the EU Member States there is a developed system of support for small businesses, ongoing work is being done to improve the activities of advisory and information support institutions;

4) a preferential tax policy is introduced for small businesses in these countries, and adequate financial support is provided.

Conclusion. The financial mechanism of development of small business, covers a set of financial methods, instruments and levers that are interconnected and interact at the state, domestic and market levels and are aimed at the implementation of economic-investment and social functions of small business under the relevant regulatory, information, institutional and infrastructure support systems. It should be noted that high rates of development of small business in developed countries are made possible by the thoughtful and systematic policy of the state. In our view, Ukraine could use the experience of Germany, France, Japan to improve the efficiency of small businesses.

Thus, an analysis of the global experience of development and state support for small businesses shows that for the effective functioning of the national economy it is imperative to form a coherent system of state support for the development of small businesses, create a high quality legal framework and eliminate the inconsistency of national quantitative criteria for the definition of small enterprises in accordance with the indicators that apply developed countries.

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ШАҒЫН БИЗНЕСТІ ҚАРЖЫЛЫҚ, НЕСИЕЛІК ЖӘНЕ ИНВЕСТИЦИЯЛЫҚ ҚОЛДАУ БОЙЫНША ШЕТЕЛДІК ТӘЖІРИБЕ

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ЗАРУБЕЖНЫЙ ОПЫТ ФИНАНСОВОЙ, КРЕДИТНОЙ И ИНВЕСТИЦИОННОЙ ПОДДЕРЖКИ МАЛОГО БИЗНЕСА

Актуальность темы исследования. В статье рассмотрены различные формы и методы государственного воздействия на развитие малых предприятий, которые используются в мировой экономической практике. Наличие большого количества различных форм государственной поддержки малого бизнеса затрудняет решение вопросов выбора наиболее рациональных. Проблемные вопросы, касающиеся форм и методов влияния государства на развитие малого бизнеса, должны заключаться в том, чтобы одни и те же рычаги могли давать разные результаты как в разных странах, так и в одном государстве на разных этапах его развития. Решение проблем, связанных с выбором наиболее рациональных форм и методов воздействия государства на развитие малых предприятий, может быть обеспечено путем адаптации зарубежного опыта к отечественным реалиям. Положительный мировой опыт развития малого бизнеса является веским аргументом в пользу его внедрения в Украине. **Цель.** Изучить и систематизировать зарубежный опыт финансово-кредитной и инвестиционной поддержки малого бизнеса, обосновать целесообразность внедрения зарубежного опыта реализации финансового механизма развития малого предпринимательства в национальной экономике. **Методы**. Методологической основой исследования являются общенаучные и специальные методы научного познания. Среди них: методы анализа и синтеза, индукции и дедукции – для выявления подходов к формам, методам и источникам государственной поддержки малого бизнеса, а также для обоснования причинно-следственных связей и определения факторов, влияющих на развитие малого бизнеса в современных условиях; метод сравнения – при изучении зарубежного опыта функционирования малого бизнеса и возможностей его использования в отечественной практике. **Результаты**. Проанализированы отдельные аспекты развития малого бизнеса во Франции путём постоянного повышения квалификации управленческого персонала малых фирм и создания законодательных гарантий по предупреждению банкротства. Рассмотрен успешный опыт экономического роста путём развития малого бизнеса стран Азии, что развиваются, среди которых: Тайвань, Сингапур, Индонезия, опыт государственной поддержки малого предпринимательства в Индии посредством развития экспортной деятельности малых компаний, предоставлении налоговых и таможенных льгот, субсидий, снижением арендных ставок и льготного финансирования. Проанализирована эффективность опыта государственного регулирования малого предпринимательства в Японии. Рассмотрен опыт Соединенных штатов Америки и Канады, которые активно предоставляют гарантии за кредитами малому предпринимательству. В свою очередь, в Германии государство оплачивает более 50% консультаций предприятиям, а также выделяет ежегодные льготные кредиты для модернизации производства. Важную роль играет и льготная налогово-финансовая система. В Чехии государство в различных формах предоставляет всестороннюю поддержку малым предприятиям частично компенсировать недостаток собственных средств, что особенно важно на начальных этапах развития, обеспечивает доступ малых предприятий к финансовым ресурсам, стимулирует создание новых рабочих мест, оказывает поддержку экспортно-ориентированным и инновационным малым предприятиям. Основной формой поддержки малых предприятий Чехии является предоставление финансовой поддержки в рамках целевых государственных программ. Государственная политика Испании по развитию малых предприятий направлена на обеспечение конкурентоспособности отечественной продукции на международных рынках сбыта, реализатором которой является Институт малых и средних предприятий. Также в Испании практикуется предоставление помощи предпринимателям через общества взаимного гарантирования. Великобритания активно использует инструменты бюджетной, налоговой и кредитной политики для стимулирования этого сектора экономики. Для предприятий малого бизнеса снижены ставки подоходного налога: при стандартной ставке 35% ставка для малых предприятий составляет 27%. Как показывает опыт развитых стран, малый бизнес успешно развивается в условиях постоянной и эффективной государственной поддержки, в условиях оптимального соотношения развития крупного, среднего и малого бизнеса.

Ключевые слова: предпринимательство, бизнес, малый бизнес, государственная поддержка и регулирование, финансовая, кредитная и инвестиционная поддержка малого бизнеса.

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MAIN WAYS TO IMPROVE THE FINANCIAL CONDITION OF THE ENTERPRISE

Abstract. The purpose of the analysis of the financial condition of the enterprise is to timely identify the shortcomings of the enterprise and their elimination, search for sources of improving the solvency of the enterprise. This determines the main tasks of analyzing and evaluating the financial condition of the enterprise. Principles of financial analysis is the continuity of the state and development of financial processes, consistency, significance, objectivity, reliability, resilience of these forms of financial reporting, practical relevance, comprehensiveness, unity and consistency, clarity of interpretation of the results of financial analysis, frequency and effectiveness of management decisions.

A number of enterprises face a shortage of funds necessary to finance their economic activities, due to the restriction of their own resource base as a result of the transition of the financial situation to an inefficient value. In this case, enterprises should reduce or completely stop production activities. Accordingly, the decline in production increases in the country, the crisis level deepens, that is, there is a decrease in the resources used for payments between enterprises and the state, between enterprises themselves and other economic entities. As a result, there is a multiplicative effect: a break in one place in the calculation chains instantly moves along the line, increasing its strength and directly and indirectly affects other participants with other social name.

An analysis of methods for assessing the financial position will lead to the conclusion that a single methodology for selecting financial position standards is not ready. Many economists and financiers in the analysis of the financial situation, along with various blocks, determine different indicators of financial stability and their normal values. The questions that arise when choosing methods for assessing financial conditions based on review and comparison of special foreign literature are brought in order.

Key words: financial indicator, financial stability, funds, capital, deficit, solvency, debt, equity, balance sheet, debt capital, resource, turnover, debt.

Currently, it is particularly important to identify the main issues of the normal financial situation of the enterprise and study their causes, firstly, it is closely related to external macroeconomic conditions, secondly, to the methods of comprehensive analysis and objective assessment of the financial condition of the enterprise, and thirdly, to the effectiveness of management of the enterprise's property based on the results of analysis of the overall economic potential.

The study of the main issues of solvency of the enterprise shows that the borrowing of economic entities is a very common phenomenon, accompanied by market changes. A number of enterprises are subject to bankruptcy due to various reasons of not being able to adapt to the relationship in market conditions. Therefore, in this regard, the main purpose of analysis of the solvency of enterprises is to identify the causes of losing the solvency and to determine the main ways of its initial recovery [1].

The tendency to improve the methodology and main directions of assessing the financial condition of an enterprise has a consistent evolutionary character, but it has objective prerequisites:

- firstly, the tendency to increase the number of features is observed, except for the rules related to the interpretation of the results of the analysis revealed when using standard methods. So, at present, the financial condition of a number of enterprises may seem weak, but the chronic nature of this situation does not allow us to make a single decision about the inefficiency of corporate management. There is also an increase in the number of works on which the feasibility of such financial models is determined when adapting methods for managing the level of liquidity, capital efficiency and activity. E.G. Chapkina described several ways to ensure coordinated financial models in her work;

- secondly, to improve indicators of financial stability in to develop the indicators of financial stability of the enterprise it is necessary to take into account the values of such indicators and branch features of activity of the enterprise: industry characteristics of the enterprise are not taken into account in any of the modern methods of assessment. Thus, it is clear that the balance structure of enterprises engaged in retail trade and companies in the construction industry will be different, so when analyzing their financial condition, additional expert work is required, taking into account intersectoral comparisons. However, due to the lack of necessary information, a number of issues arise. In this connection, We can quote an excerpt from the works of N.V.Zhakhov. In his opinion, conditions due to industry-specific features, such as commodity price control or strict sanitary supervision, have an adverse impact on the activities of economic entities, even if there are no other factors of business activity and capital structure. In addition, S.A.Golovikhin and D.I.Kuznetsov's work suggests using other factors, such as the size of the enterprise, the complexity of its organizational structure, or the geography of its operation;

- thirdly, it is unfair to emphasize financial management from internal enterprise management systems. Therefore, conducting analytical procedures must be fulfilled with modern management analysis tools, such as market analysis and break-even, strategic analysis in the study of the structure and composition of the emphasize's property, cash flows and sources of their formation, the main economic bases of reserves for improving the quality and efficiency of cost. Therefore, According to O.V. Kozhevina, in order to improve the financial situation of the enterprise, it is mandatory to analyze trends carried out by increasing the cost of capital of the enterprise, along with studying the directions and goals of its development strategy [2-4].

An important factor that has a significant impact on reducing the solvency and financial stability of enterprises is the cost of accounts receivable as part of current assets. Therefore, in this regard, there is a need for a more in-depth study of the state of accounts receivable. It is not difficult to determine the effective and optimal value for accounts receivable as part of an enterprise's assets, but for Kazakhstani enterprises that produce and provide services, if the share of accounts receivable in the total balance sheet currency is no more than 30%, and if it is not overdue, the value of accounts receivable is considered optimal and effective. And the meaning that exceeds this indicator is a reflection of the unjustified immobilization of funds in the assets of the enterprise.

Accounts payable are the total amount of short-term obligations to the budget and other financial obligations to pay wages to employees, suppliers and vendors, and one of the main sources of funds raised by the enterprise. Accounts payable are often made when the debt of one enterprise is paid after a certain period and the occurrence of debt of the enterprise, first, clearly reflected in its account, and at the end of the period as a result of the specified system of settlements between enterprises that repay the debt. Also, accounts payable are the result of the company's failure to fulfill its obligations within the established period. Analysis of the company's accounts payable due to deferred payments is recommended to determine the degree of financing of the company's production turnover. Mutual comparison of accounts payable and accounts receivable, if the enterprise corresponds to the passive balance between the analyzed periods, then the enterprise provides customers with cheap commercial credit in the amount of less than the amount received by leaving payments to contractors and suppliers for a subsequent period. If there is a surplus balance, it indicates that the main source of financing is bank loans and its own sources, which exceed the volume of loans issued to its customers from suppliers. For an enterprise, matching the passive balance for this indicator is more effective, and matching the active balance is an inefficient factor [5-7].

The final results obtained as a result of the study should be used to find ways to improve the degree of solvency of economic entities. As a rule, any of the enterprises faces various cases related to accounts payable and receivable.

Currently, the solvency of the enterprise directly affects the efficiency of using current assets, but limited economic and financial opportunities arise serious problems, the solution of which depends on the existing market conditions for the purchase of raw materials and the sale of goods necessary for the production of enterprise products.

The state of financial resources that shows the future development of the enterprise by maintaining the solvency and creditworthiness of the enterprise, growth of income in the possible amount of risk, use and distribution of financial resources, reflects the financial stability of the enterprise. This situation was closely related to the production result, as well as the final indicators of economic activity of the enterprise. Reduced production volumes and high production costs, respectively, contribute to the deterioration of the financial stability of the enterprise. This situation is influenced by a number of internal and external factors.

Internal factors arise in connection with the organization of the enterprise's activities, and external factors are not subordinate to the activities of the enterprise.

First of all, let's consider the internal factors. A stable financial position of an enterprise primarily depends on the structure and composition of services provided and products sold, which are inextricably connected with production costs. The relationship between fixed and variable production costs is also very important (figure 1).

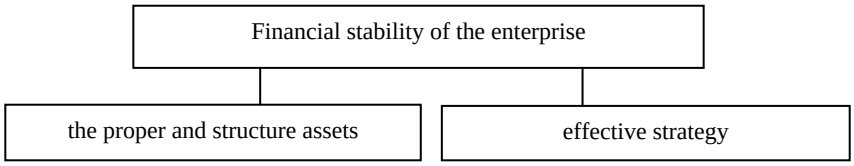

Figure 1 – The important factors affecting the financial position of the enterprise. Note – compiled by the author

The important factors affecting the financial condition of the enterprise, which directly depend on the production technology and production of manufactured products:

- the proper content and structure of assets;
- effective management strategy.

A current asset management system is characterized by the presence on the company's accounts at the minimum amount of funds necessary for its current operational activities.

Also, among the most important internal factors of financial stability of the enterprise are the structure, composition of financial resources, tactics and the correct choice of strategic policy for managing them. As much as there is a lot of net income of the enterprise, the potential of its financial resources will be that good. Not only the amount of net income, but also its distribution is very specific and its part is the most important financial resource aimed at expanding production.

Changes in the loan capital market also affect the financial condition of the company. As much money is distributed to the enterprise, the financial capabilities of this enterprise are at the same high level, however, the level of financial risk increases, the enterprise may not be able to pay its creditors on time. In this situation, special attention is paid to reserves, as this is one of the financial guarantees of the enterprise's solvency.

Based on the above-mentioned factors, the main internal factors that affect the financial position of the identified enterprise are shown in figure 2.

And now the external factors that affect the financial position of the company:

- state of development of modern equipment and technology, mostly used in the market;
- average income level of paying consumers;
- influence of the main economic management conditions;
- fiscal policy of the Government of the Republic of Kazakhstan and monetary policy of the National Bank;
- norms of the regulatory legal act regulating the control of the enterprise's activities;
- external macroeconomic services, etc.

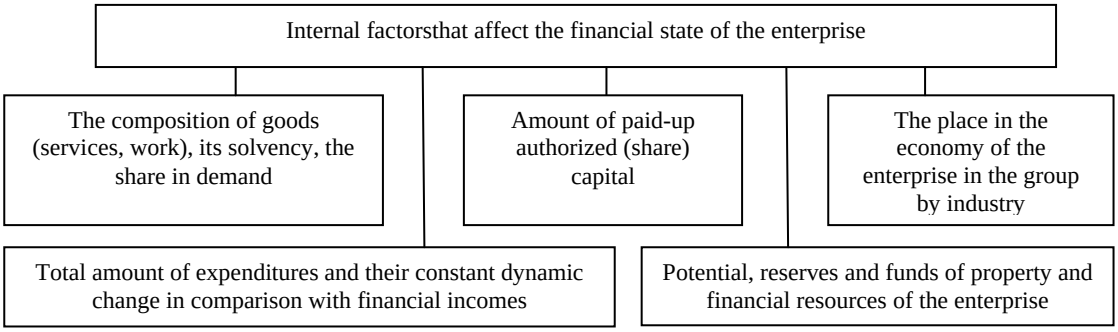

Figure 2 – The factors affecting the financial position of the enterprise. Note – compiled by the author

Financial stability of the enterprise is the state of financial resources that reflect the level of development of the enterprise by attracting and using funds on the basis of increasing income with an acceptable appropriate level of risk, while maintaining a moderate solvency and creditworthiness. It is closely related to the efficiency of production and the final results of economic activity of the enterprise. Reduction of the enterprise's production volumes and high production costs leads to deterioration of the enterprise's financial stability.

In order to improve the financial situation in the enterprise management system, the following measures can be proposed: all assets should be based on increasing the share of equity capital mainly within the sources of formation. In order to maintain the sustainable potential of the financial situation, a strategy of optimally created future is necessary.

In its strategy, it is necessary to determine the following main goals of the enterprise, the course of the enterprise's activities for the upcoming period, improving the quality of products (works performed, services rendered), ensuring production efficiency with a reduction in costs, reducing the cost of production and determining ways to approve the appropriate amount of profitability. The strategy of the enterprise should organize the financial resources, effective operation and stability of the financial position of the enterprise. The analysis of indicators of business activity of the enterprise shows the degree of indicators of turnover of various resources and their movement, allowing to determine how effectively the company's own funds are used. The study of indicators of business activity of an enterprise reflects the efficiency of using funds owned by it. Business activity of an enterprise is primarily characterized by the speed of turnover of funds in the financial position.

I. A. Blank identified the following ways to improve the size of business activity in his writings:

– increasing in the share of receipts within funds, which will mainly be aimed at reducing the volume of all expenses. In this regard, constant monitoring of the formation of costs is carried out;

– increasing the turnover rate of asset items, i.e. increasing the business activity of the enterprise [8-12].

First, to increase the profitability of the company's assets, it will be aimed at generating income from the company's activities, as well as increasing its volume. In order to increase the company's revenue from sales of products, special attention should be paid to the development of the retail network to obtain additional margin income. Also, an important direction for improving the company's performance is to reduce the cost of production. And the only solution to reduce the cost of production is to increase the volume of production since in this case, the value of fixed costs for each unit of production is reduced.

If the revenue from the sale of products is at a level below its full cost, the company incurs losses. Therefore, in many enterprises, the “profitability threshold" method is used to improve the efficiency of the enterprise's economic activities.

The use of the "profitability threshold" method is one of the most important measures to improve the financial situation of enterprises. In addition, this method can be used in the formation of a range of cost-effective products, pricing and development of an effective commodity pricing policy. This measure is necessary to determine the volume of production that is dangerous for enterprises and calculate the value of sales prices of dangerous goods. The main production assets of the enterprise make up the economic and social base of materials and the composition of their production staff. Improving the quality of the

composition of fixed assets and improving the efficiency of their use are the main factors for increasing the level of labour productivity and reducing the cost of production.

The main ways to improve the efficiency of using the technical potential of the enterprise are shown in figure 3.

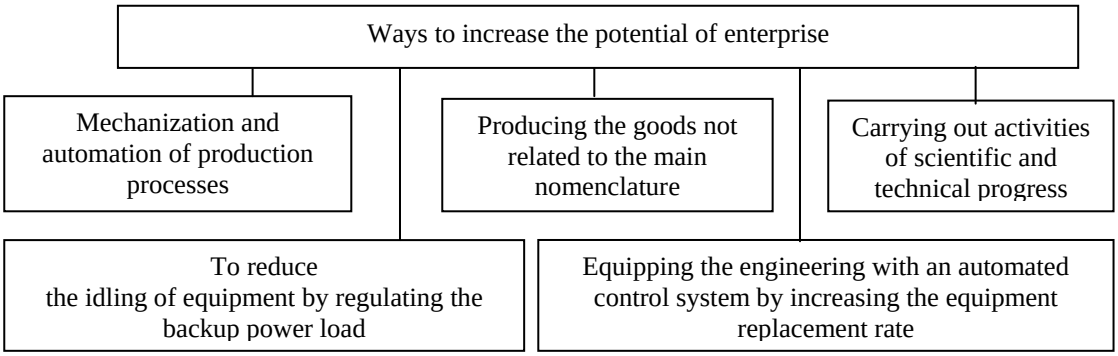

Figure 3 – Ways to increase the technical potential of the enterprise. Note – compiled by the author

Measures to overcome the crisis of the enterprise are divided into strategic, aimed at developing the general concept of financial recovery and development of the enterprise in the short and long term, developed for implementation in the shortest possible time, as well as its implementation. As part of management in crisis and bankruptcy situations, the company offers a targeted selection of the most effective tools for improving the financial situation and tactics necessary for the company in real conditions. Studying the experience of overcoming the crisis of many foreign and domestic companies allows us to identify two types of the most common tactics that allow us to create some general conclusions that are mandatory for each company (figure 4).

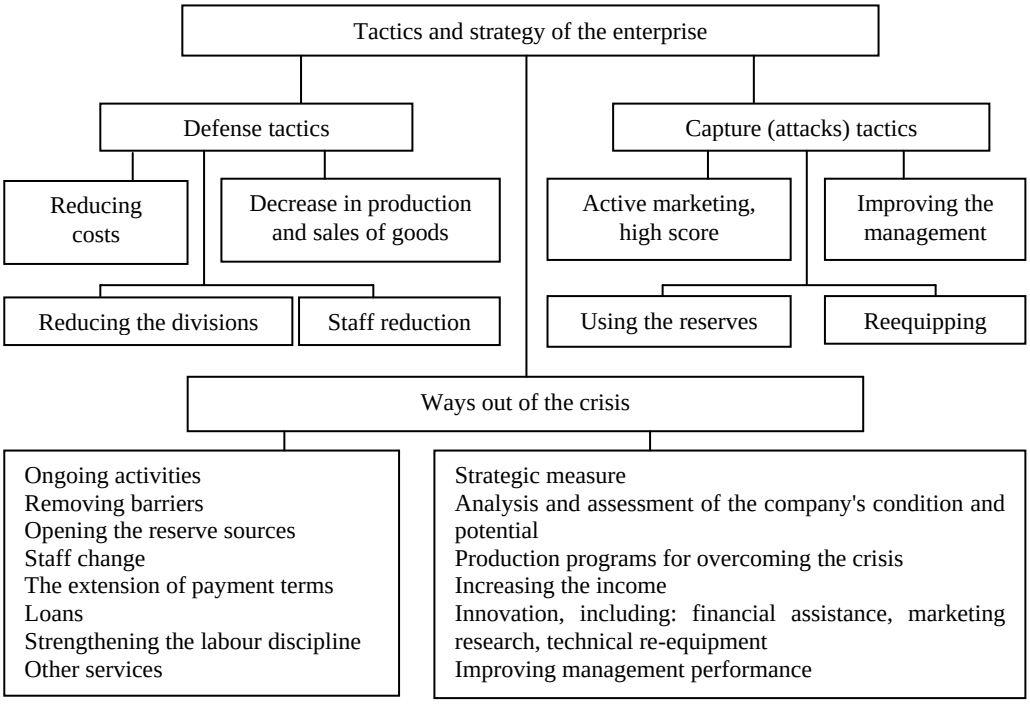

Figure 4 – Tactics and strategy of the enterprise and ways out of the crisis. Note – compiled by the author

Defense tactics are based on carrying out balance-saving measures based on reducing the total volume of production and reducing the costs associated with the supply of fixed assets and personnel. It is usually used in a very unfavorable combination of external conditions. However, it may also be effective

for some businesses that are waiting for a resumption of business activity and favorable market conditions; this tactic is unfavorable for most businesses.

It is obvious that the mass use of defence tactics of most enterprises is subjected to an even more complex crisis of the national economy, so it is obvious that this will not lead to the financial prosperity of the enterprises that use them, the reasons for which are clear – all the main causes of the crisis occur in the external environment outside the enterprise. The enterprise's defence strategy is usually limited to applying appropriate operational measures: identifying internal resources, personnel changes, strengthening disciplinary measures, reducing costs, and regulating agreements with creditors and other businesses.

Capture (attacks) tactics are more effective, i.e. more effective than operational actions. In this case, it implements resource-saving measures, active marketing, exploring and conquering a new market, setting high prices, increasing costs for modernization, production modernization, modernization of fixed assets and introduction of advanced technologies.

However, there is a change or enhancement of the enterprise management, comprehensive analysis and assessment of the situation, if necessary, the philosophy, main principles of activity of the enterprise, i.e. its strategy change, according to that strategy the program is revised, the position of enterprises is strengthened on the market, the new market segments are updated, the scale of production is updated. All this is reflected in the concept of improving the financial, production and personnel, in accordance with which financial, marketing, technical and investment programs are adopted, which will increase the financial well-being of the enterprise.

A set of anti-crisis measures can be proposed as a bankruptcy system. In priority situation, the bankruptcy system can be understood, monitored, diagnosed and considered as a system of bankruptcy protection, where there are measures to protect the interests of potentially viable debtor enterprise, as well as creditors in the case of economic insolvency of the debtor, in which there are serious difficulties in ensuring solvency.

There are three stages common for the bankruptcy development process: hidden, financial instability and open bankruptcy. The beginning (or periodic arrival) of these stages methods and ways for determining signs of bankruptcy are different [13-19].

The forecast of future bankruptcy in the hidden period is possible for 1.5-2 years before the appearance of obvious signs. For these purposes, there are several proven methods (for example, estimating the company's liquidity value using the Wilcox formula, using the Altman formula, etc.). However, the use of most of them, including the most reliable methods, due to the lack of the established secondary securities market and the lack of relevant information about their value, is considered difficult in our situation.

Defining the boundaries of the financial situation at the enterprise is one of the most important economic issues in the transition to a market economy, since the deterioration of the financial situation can lead to a lack of funds for the development of production at the enterprise, their insolvency, ultimately, to bankruptcy, and "excessive" stability hinders the development of the enterprise, weighing down losses with unnecessary stocks and reserves.

Financial position is the characteristic of the dynamics of the enterprise in the process of their reproduction, reflecting their ability to allocate funds of the enterprise and further development of the enterprise. Principles of financial analysis and evaluation is the continuity of control over the state and development of financial processes, objectivity, consistency, importance, reliability, dynamism, versatility of these forms of accounting, practical relevance, consistency and unity, transparency in explaining the results of financial analysis, efficiency and frequency of management decisions. The content of financial analysis is determined by who is the user of the information and what the scope of economic interests is in assessing aspects and various sides of the financial activities of the enterprise [20-21].

In conclusion, the following measures are proposed to improve the financial situation of the company:

- to pay special attention to the structure and volume of produced goods, to use opportunity costs and dumping in the development of new types of goods;

- accelerated solution of issues related to reducing standard stocks of raw materials and finished products, improving their standardization, accounting and evaluation of surplus stocks;
- use of modern methods at the enterprise and development of the dealer network, promotion to new markets of products based on work on after-sales and service, etc.;
- improving the effectiveness of accounts receivable management, inventory tools, and monitoring.

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КӘСІПОРЫННЫҢ ҚАРЖЫЛЫҚ ДАНА ЖАҒДАЙЫН ЖАҚСАРТУДЫҢ АРҚЫЛЫ НЕГІЗГІ ЖОЛДАРЫ

Аннотация. Нарықтық экономикаға өту кезінде кәсіпорынның қаржылық жағдайының шекарасын анықтау – қазіргі кезде ең маңызды экономикалық мәселелердің бірі, себебі қаржылық жағдайдың тұрақсыздығы кәсіпорында өндірісті кеңейту үшін ресурстардың жетіспеушілігіне, ал төлем қабілетсіздігі банкротқа, «артық» қаржылық тұрақтылық кәсіпорынға қажетсіз қор, резервтері арқылы салмақ түсіріп, кәсіпорынның дамуына кедергі келтіруі мүмкін.

Кәсіпорынның қаржылық жағдайын талдаудың мақсаты – кәсіпорын қызметінің кемшіліктерін мерзімінде анықтау және оларды жою, кәсіпорынның төлем қабілеттілігін жақсарту көздерін іздеу. Бұл кәсіпорынның қаржылық жағдайын бағалаудың және талдаудың негізгі міндеттерін анықтайды. Қаржылық талдау қағидалары – қаржылық үрдістердің жай-күйі мен дамуының үздіксіздігі, жүйелік, маңыздылық, объективтілік, сенімділік, қаржылық есеп нысандары деректерінің серпінділігі, тәжірибелік тұрғыдан өзектілігі, жанжақтылығы, бірлігі мен жүйелілігі, қаржылық талдау қорытындыларын түсіндірудің анықтығы, басқару шешімдерін қабылдаудың мерзімділігі және тиімділігі.

Кәсіпорын қаржысын тиімді басқару мақсатында кәсіпорынның қаржылық жағдайын бағалауды жүргізу қаржылық көрсеткіштерді есептеуден басталады. Қаржылық көрсеткіштер қаржылық мәліметтердің ауқымды көлемін жалпылауға, қаржылық жағдайдағы өзгерістерге және осындай өзгерістердің бағыты мен құрылымын көруге, диагностика жүргізуге және мерзімінде түзетулер енгізуге мүмкіндік береді. Кәсіпорынның қаржылық жағдайының бағалау әдістемесін таңдау кезінде салалық ерекшеліктерді, қаржылық жоспарлау жағдайын, жүргізілетін қаржылық саясатты, менеджерлердің біліктілігін ескере отырып, қаржылық көрсеткіштерді дербес таңдау қажет.

Бірқатар кәсіпорындар қаржылық жағдайының тиімсіз мәнге ауысуы нәтижесінде меншікті ресурстық базасының тарылуы әсерінен өзінің шаруашылық қызметін қаржыландыру үшін қажетті қаражаттардың тапшылығына кездеседі. Бұл жағдайда кәсіпорындар өндіріс қызметін қысқартып немесе мүлдем тоқтатуы тиіс. Сәйкесінше елде өндіріс құлдырай бастайды, дағдарыс деңгейі артады, яғни кәсіпорындар мен мемлекет арасындағы, кәсіпорындардың өзара және өзге де экономика субъектілері арасындағы айналымдағы төлемге пайдаланатын ресурстар азая бастайды. Соның нәтижесінде мультипликативтік әсер пайда болады: есептеу тізбегіндегі бір жердегі үзіліс сызық бойымен лезде орын ауыстырады, ол күшін арттырып, қоғамдық өндірістің басқа да қатысушыларына тікелей және жанама ықпал етеді.

Көптеген экономистер мен қаржыгерлер қаржылық жағдайды талдауда түрлі блоктармен қатар, қаржылық тұрақтылық көрсеткіштерін және олардың нормалық мәндерін анықтап көрсетеді. Арнайы шетелдік және отандық әдебиеттерді шолу мен салыстыру негізінде қаржылық жағдайды бағалау әдістерін таңдауда туындайтын мәселелер жүйеге келтірілген.

Түйін сөздер: қаржылық көрсеткіш, қаржылық тұрақтылық, қаражат, капитал, тапшылық, төлем қабілеттілік, қарыз, меншікті капитал, баланс, қарыз капиталы, ресурс, айналым, берешек.

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ОСНОВНЫЕ ПУТИ УЛУЧШЕНИЯ ФИНАНСОВОГО ПОЛОЖЕНИЯ ПРЕДПРИЯТИЯ

Аннотация. Определение границ финансового положения предприятия при переходе к рыночной экономике – одно из самых важных экономических проблем в настоящее время, поскольку нестабильность финансового положения может привести к недостатку ресурсов для расширения производства, а также неплатежеспособность к банкротству, «излишняя» финансовая устойчивость организации ненужными запасами, резервами к отягощению может препятствовать развитию предприятия.

Цель анализа финансового положения предприятия – своевременное выявление недостатков деятельности предприятия и их устранение, поиск источников улучшения платежеспособности предприятия. Это определяет основные задачи анализа и оценки финансового положения предприятия. Принципы финансового анализа – непрерывность состояния и развития финансовых процессов, системность, значимость, объективность, надежность, динамичность данных форм финансовой отчетности, практическая актуальность, всеобщность, единство и системность, ясность интерпретации результатов финансового анализа, срочность и эффективность принятия управленческих решений.

В целях эффективного управления финансами предприятия проведение оценки финансового положения предприятия начинается с расчета финансовых показателей. Финансовые показатели позволяют обобщить широкий объем финансовых данных, увидеть изменения в финансовом положении, направления и структуру этих изменений, проводить диагностику и своевременно вносить коррективы. При выборе методики оценки финансового положения предприятия необходимо самостоятельно выбирать финансовые показатели с учетом отраслевых особенностей, состояния финансового планирования, проводимой финансовой политики, квалификации менеджеров.

Ряд предприятий сталкиваются с дефицитом средств, необходимых для финансирования своей хозяйственной деятельности вследствие сужения собственной ресурсной базы в результате перехода финансового положения на неэффективное значение. В этом случае предприятия должны сократить или полностью прекратить производственную деятельность. Соответственно, в стране возрастает спад производства, углубляется уровень кризиса, т.е. все ресурсы, используемые для платежей в обращении между предприятиями и государством, между самими предприятиями и другими экономическими субъектами, начинаются сокращаться. В результате этого возникает мультипликативный эффект: перерыв в одном месте в цепочке вычислений мгновенно перемещается по линии, увеличивая свои силы, прямо и косвенно воздействует на других участников общественного производства.

Многие экономисты и финансисты в анализе финансового положения, наряду с различными блоками, определяют различные показатели финансовой устойчивости и их нормативные значения. На основе обзора и сравнения специальной зарубежной и отечественной литературы систематизированы вопросы, возникающие при выборе методов оценки финансового положения.

Ключевые слова: финансовый показатель, финансовая устойчивость, средства, капитал, дефицит, платежеспособность, долг, собственный капитал, баланс, заемный капитал, ресурс, оборот, задолженность.

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FORMATION OF SCIENTIFIC POTENTIAL AND QUALITY OF LIFE IN SINGLE INDUSTRY TOWNS OF THE REPUBLIC OF KAZAKHSTAN (THE CASE OF ZHEZKAZGAN CITY)

Abstract. The development of methodological approaches and organizational measures to solve the problems of increasing level and quality of life of the population in single-industry towns based on an analysis of the status and development trends of the scientific potential. The methods which were used in this study are logical, statistical analysis and synthesis. The new idea is that the indicator of improving the quality of life of the population in depressed regions is staffing of scientific and innovative activities. The results of this study can be further developed to measure the general level of the status of scientific personnel'strainingand the conditions for its growth in the general context of improving the quality of life of the population. A new approach has been formed in the methodology of measuring the level and quality of life of the population. An organizational mechanism for the interaction of science and production is proposed, combining the scientific potential of the university and the industrial city-forming enterprise. The results and conclusions of the study can be used by territorial and state economic management bodies in elaboration of economic development programs and in determining the level and quality of life of the population.

Key words: scientific potential, single-industry town, quality of life, training of scientific personnel, indicators, mechanism, interaction of science and production,

Introduction. Successful implementation of technological modernization of industrial enterprises should solve the socio-economic problems of cities, which is possible if the scientific potential is created and developed in the regions. In single-industry towns, science has not become a productive force that gives the economy innovative development. This problem determines the importance of the study. The problem of single-industry towns is known to almost all industrialized countries. This was primarily due to scientific and technological progress. Such problems as the closure of unprofitable mines, obsolete factories had to be solved by Great Britain, France, Germany, and other countries of Western Europe [1]. In the conditions of an unstable economic situation, searches are constantly being carried out for ways to strengthen economic stability in the regions. The development of scientific and innovative activity can be considered as a long-term fundamental factor in solving this problem [2,3,4,5].

Achieving the goals of improving the quality of life in single-industry towns is associated with the formation of an economy based on innovation. Many countries seek to strengthen global economic competitiveness by building the potential of a "knowledge economy" [6]. We are talking about the

intellectualization of society, increasing the role of science and education [7,8]. The importance of network approaches, capacity building, technology-based entrepreneurship and leadership in the local innovation system is emphasized in the works of Marshall & Dolley, Luc Soete, Bruce A.Weinberg [9,10,11]. For the purposes of this article, the author was interested in the approach of a number of researchers who examined the problems of depressed territories with low indicators of the social status of the population and their conclusions that the increase in investment in R&D mainly affects areas with a routine where low-skilled jobs were created [12,13].

The working hypothesis of this study is consistent with the studies of Lee & Clarke, Gadzhiev Y.A., Styrov M.M., Kolechkov D.V., Shlyakhtina N.V. and the fact that the solution of the problems of single-industry towns is possible through the creation of a high-tech innovative economy and the solution of the problem of assessing innovative potential and determining the main directions of scientific and technical development of regions [14,15].

However, the author considers this approach to assessing scientific potential insufficient and not linked to a general assessment of the level and quality of life in a particular territory. In particular, Quanen Guo and Kemeny & Osman, who investigated this relationship between innovation and income inequality, also pointed to this in their works [16,17].

In addition, an analysis of the available foreign studies revealed the limitations of the approach to the interaction of research institutes with industrial enterprises and / or universities [18], suggesting that bilateral interaction between research institutes and industries can have a more positive impact on scientific activity, both direct and indirect way.In addition, an analysis of the available foreign studies revealed the limitations of the approach to the interaction of research institutes with industrial enterprises and / or universities [18], suggesting that bilateral interaction between research institutes and industries can have a more positive impact on scientific activity, both direct and indirect way. The same opinion is shared by the authors of the study Allison Bramwell, David A. Wolfe [19].

In his study, the author relies on the findings of researcher A. Ibraev about the isolation of domestic sciences from the real needs of the regions [20]. An analysis of the works of foreign and domestic scientists revealed a lack of research on the quality of life of the population and the socio-economic development of single-industry towns through the prism of scientific potential in them, as well as on the formation of an organizational mechanism for the interaction of science and production, combining the scientific potential of the university and the largest industrial city-forming enterprise. This study attempts to fill this gap.

The author sees the solution of the problem in the search for such an organizational mechanism that would make it possible to turn the disparate scientific potential of the industrial single-industry town into a scientific center for fundamental and applied research, with subsequent development into the main element of the regional innovation infrastructure. And the use of an indicator of scientific potential as an indicator of the quality of life in mono-settlements is impossible without a developed methodology for its justification and measurement.

Materials and methods. As a methodological approach, a systematic approach is used, within the framework of which methods of logical, statistical analysis and synthesis are provided. In the study of the state and trends in the training of scientific personnel and the impact of this on the quality of life of the population of a single-industry town, empirical general scientific methods of cognition are used. The method of observation and collection of facts made it possible to assess the current state of training of scientific personnel and the quality of life of the population in a single-industry town, to identify existing problems.

Results. I. An analysis of the status and trends of training scientific personnel in a single-industry city and region (for example, Zhezkazgan) revealed the following:

1. The dominant position in the sectoral structure of the scientific potential of the region is occupied by the higher education sector, where research was carried out by university scientists (table 1). The characteristics of organizations conducting research in the Zhezkazgan single-industry town are presented in table 1.

Table 1 – Number of researchers and organizations performing research and development in the Zhezkazgan region

Research Organizations	2017		2018	
	Number of researchers		Number of researchers	
	Total people	%	Total people	%
Zhezkazgan University named after O.A. Baikonurov	16	59,26	13	50,0
Scientific Design Institute	9	33,33	11	42,31
Mining Institute LLP	2	7,41	2	7,69
Total	27	100	26	100
Note: Compiled by the authors based on the reporting data of the organization				

2. In single-industry towns, science has not become a productive force that gives the economy innovative development. In the territorial structure of the country's scientific and technical potential, there are deep imbalances in the provision of human resources (tables 2 and 3).

Table 2 – Provision of scientific personnel Zhezkazgan University named after O.A. Baikonurov

The total number of teaching staff	including			Share in the total number of teaching staff,%
	doctors of Science	doctors PHD	candidates of sciences	
116	4	2	44	43,10
Note: Compiled by the authors based on the reporting data of the organization.				

For the period from 2014 to 2019, the scientific potential of Zhezkazgan University decreased 1.72 times, or by 36 people. The main losses of scientific personnel occurred in the indicated period, which was a consequence of a decrease in the standard of living in a single-industry town, and a lack of prospects for career and personal, professional growth in a scientific province.

Table3 – Provision of scientific personnel of Zhezkazgan University named after O.A. Baikonurov from 2010 – 2019

Years	2009	2014	2019
The indicator of availability of scientific personnel,%	49,24	49,14	43,10
Note: Compiled by the authors based on the reporting data of the organization.			

It can be stated that today the personnel potential of science at Zhezkazgan University is only 43.10% compared with the 2009 level. At the same time, we can conclude that there is the scientific potential of university science to study regional problems of an intersectoral nature. Unfortunately, in modern science and practice there is no methodology for measuring, analyzing and comparing data on the level of the scientific personnel potential of the region. In order to use the indicator of scientific personnel potential in the format of an indicator of the socio-economic development of a single-industry town, it is necessary to determine the possibilities for measuring it.

II. The list of indicators for measuring the scientific personnel potential of a single-industry town.

The authors consider it appropriate to use the following indicators for statistical and sociological measurement of the level of training of scientific personnel in the region and the conditions for its growth in a single-industry town (table 4).

The above mentioned indicators for assessing the level of training scientific personnel in the region and the conditions for its growth in a single-industry town are not strictly defined, some indicators can be changed, reduced, and their expansion is permissible. The main task of their application is to ensure the

consistency of a group of indicators for comparing data both in dynamics and with similar objects (for example, with others with average values for the region). Subject to these conditions, the identified integrated assessments will comprehensively reflect the state of scientific potential in the region (city).

Table 4 – The list of indicators

Indicator name	
Statistical indicators of the level of scientific personnel potential	- the number of researchers in % of the population;
	- the number of organizations performing research and development;
	- the number of doctors of sciences, doctors of philosophy (PHD), candidates of sciences, including the ones that carry out research and development;
	- the dynamics of the number of doctors of sciences, doctors of philosophy (PHD), candidates of sciences for a five-year period;
	- the number of University graduates engaged in scientific research;
	- the dynamics of the number of applicants to master's and doctoral programs;
	- the percentage of graduates who have chosen scientific activity as a profession.
Statistical indicators of conditions for the development and growth of scientific personnel potential	- the ratio of the average salary of researchers to the salary of employees in organizations
	- the ratio of the average salary of researchers to the average salary in the region
	- the amount of research funding from government agencies and other organizations
	- the level of average monthly income per a member of a researcher's family
Sociological indicators of scientific personnel support	- the self-assessment of the general standard of living (material well-being);
	- the self-assessment of buying opportunities of researcher’s family income;
	- the assessment of the standard of living of single-industry town residents;
	- the assessment of the relevance of the poverty problem of the life in a single-industry town.
Sociological indicators of conditions for the development and growth of scientific personnel potential	- general life satisfaction
	- the generalized assessment of living conditions of the population
	- the assessment of the own health and the health of family members
	- satisfaction of researchers with the activities of state science and education management bodies and local executive authorities
	- satisfaction with medical services
	- the assessment of natural and climatic conditions of the living area
	- satisfaction with environmental conditions
	- accessibility and satisfaction with the work of preschool institutions
	- satisfaction with the quality of education in general education institutions
	- satisfaction with the work of educational organizations of secondary special education and higher education;
	- satisfaction of a researcher with the work and its various conditions;
	- satisfaction with housing conditions (state, area, amenities).
Note: Compiled by the authors based on the organization's reporting data.	

III. The organizational mechanism of the interaction of science and production, forming a regional innovation infrastructure. The scientific and technical potential of the region, including human resources, will have its socio-economic effectiveness only if it is used in the real sector of the economy. This effect is a function of the organizational mechanism of interaction between science and production in the region.

We propose the creation of an organizational form that would make it possible to accelerate the diversification of the economy in a single-industry town, which is fully within the power of the universal potential of university science.

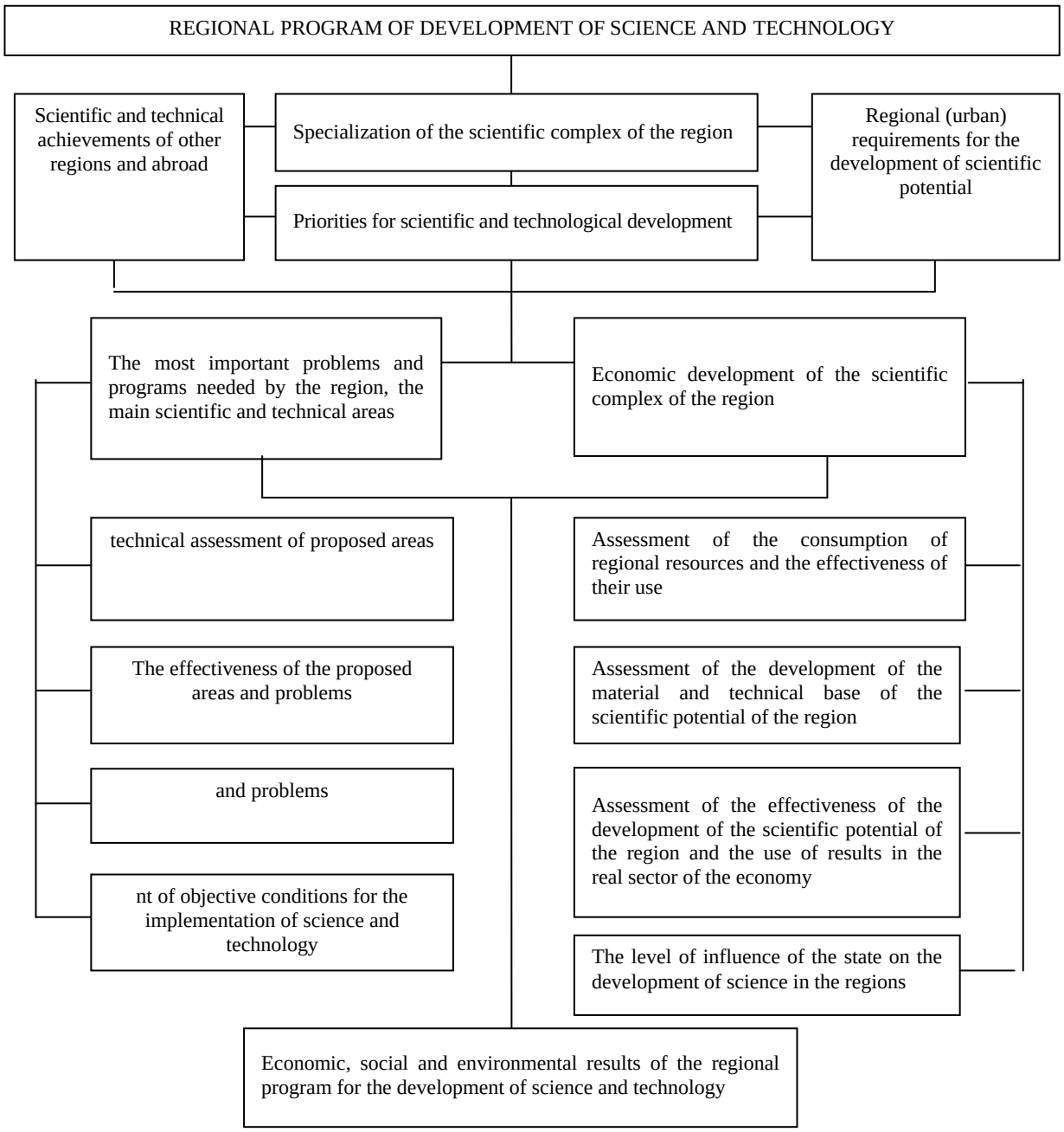

Figure 1– Block diagram of the development of a regional program for the development of science and technology

Since this organizational form provides for the development and distribution of new equipment and technologies without reference to one industry, its successful functioning is impossible without the development of a regional program of scientific and technological development. The goal of such a program would be to ensure:

- a real transition of the economy of the city and the region with mono-industrial specialization to the innovative path;
- solving accumulated social problems among the city population;
- development of the scientific potential of the region, aimed at solving the problems of a particular

region.

In such a regional program, it is possible to justify the priority areas for the development of science, taking into account the characteristics of its resource, production and scientific and technical potential. The program will make it possible to use the scientific potential of the region, taking into account its scientific and industrial specialization, which is of no small importance at the initial stages of the program. Such a program will provide a real link between science and production and lead to a knowledge-based economy and will be developed taking into account the specific needs of the city and the region as a whole. Figure 1 shows a block diagram of the development of a regional program for the development of science and technology. The importance of regional science development lies precisely in the possibility of combining intersectoral approaches to innovation with industry systems.

For a more complete use of territorial factors in the development of science, namely, the ability to concentrate the scientific forces of a regional university and an industrial enterprise on the territory of a city (region), to establish intersectoral relations between them, it is advisable to create a new organizational form - a regional research and production center. Such a center will solve the problem of establishing an effective connection between science, education and production, the intersectoral dissemination of scientific results, and the achievement of the introduction of new equipment and technology.

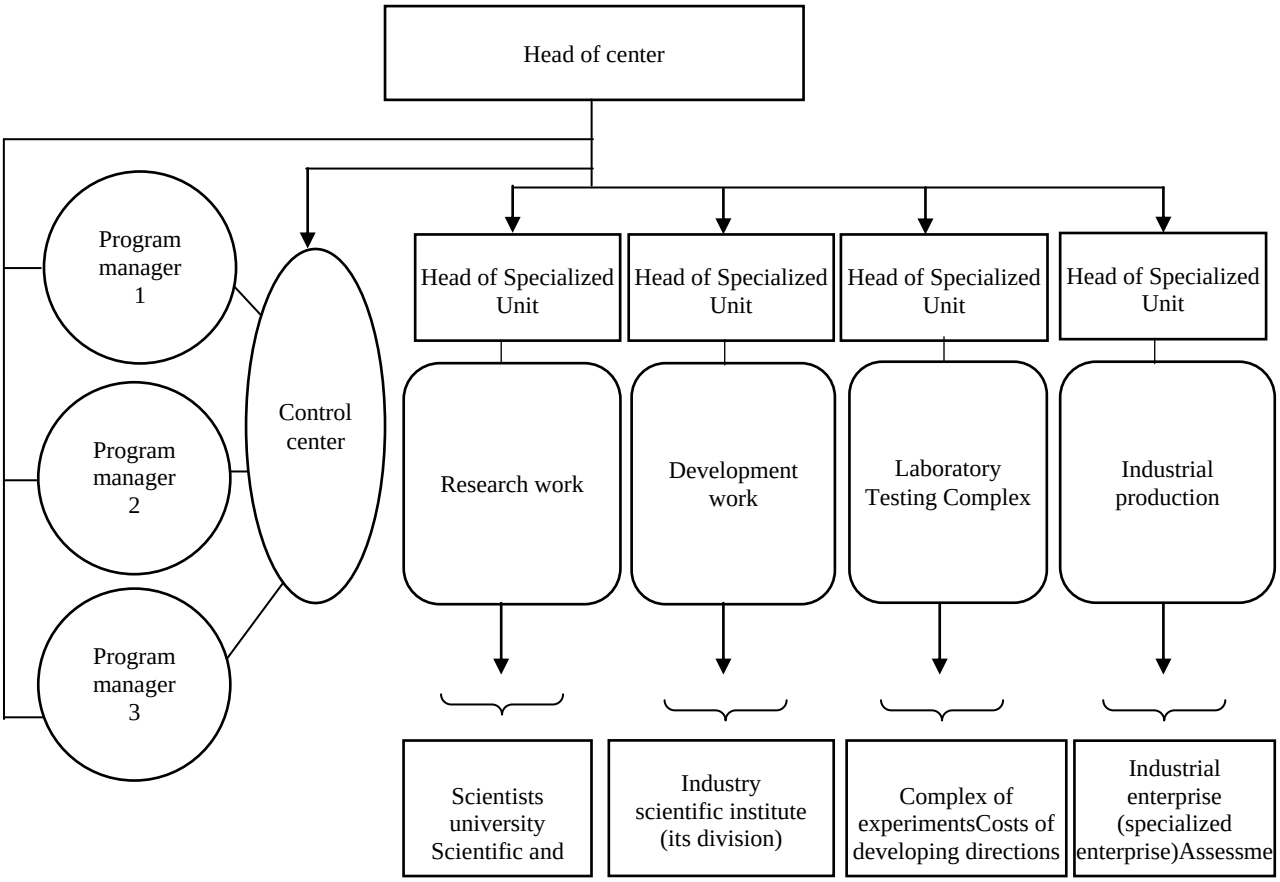

Figure 2 – Organizational chart of a regional research and production center

Based on the revealed results, a new approach has been developed in the methodology of measuring the level and quality of life of the population, which:

– firstly, it justifies the use of indicators of scientific personnel potential in the overall assessment of the quality of life;

– secondly, it is interlinked with the socio-economic problems of single-industry towns.

The practical implementation of the approach is based on the proposal of an organizational mechanism that is fully implemented in the conditions of an industrial single-industry town, which allows to begin the process of economic diversification in it. Thus, an analysis of the status and trends of training scientific personnel in the single-industry region revealed negative trends in the development of scientific human resources.

Conclusion. 1. A new approach has been formed in the methodology for measuring the level and quality of life of the population, based on the use of indicators of scientific personnel potential in the overall assessment of the quality of life.

2. The state and trends of training scientific personnel were first considered as a factor in improving living standards in the context of solving the socio-economic problems of single-industry towns and depressed territories.

3. Indicators are proposed for assessing the level of training of scientific personnel, followed by the determination of integral estimates.

4. An organizational mechanism for the interaction of science and production is proposed, in the form of a research and production center that is of an intersectoral nature and contributes to the diversification of the economy. A significant advantage of the proposed organizational mechanism is the unique opportunity to use the existing backlog in the form of technologically advanced production of a city-forming enterprise and university research potential.

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ МОНОҚАЛАЛАРЫНДАҒЫ ҒЫЛЫМИ ӘЛЕУЕТТІҢ ҚАЛЫПТАСУЫ ЖӘНЕ ӨМІР САПАСЫ

Аннотация. Өмір сапасын арттыру ғылыми әлеуетті арттыру арқылы инновациялық экономика дамыту және диверсификацияға негізделуі керек. Сонымен қатар, оның өлшеу әдіснамасы мен ірі кәсіпорынның өндірістік әлеуетін және ЖОО ғылымын пайдалануда ұйымдастырушылық механизм қалыптаспаған. Зерттеудің мақсаты – ғылыми әлеуеттің қазіргі жағдайы мен даму қарқынын талдау негізінде моноқалалардағы тұрғындардың өмір сапасын және деңгейін арттыру мәселелерін шешудің ұйымдастырушылық шаралары мен әдіснамасын өңдеу. Жаңа идея депрессивті аймақтардағы халықтың өмір сүру сапасын жақсартудың индикаторы ғылыми және инновациялық қызметті кадрлармен қамтамасыз ету болып саналады.

Әдіснамалық база ретінде өңірлерде (моноқалаларда) халықтың өмір сүру сапасы мәселелерін, сондай-ақ ғылыми-техникалық прогресс пен өңірлердің ғылыми әлеуетін дамыту мәселелерін зерттейтін ғалымдардың еңбектері пайдаланылды. Әдіснамалық тәсіл ретінде жүйелі тәсіл қолданылды, соның шеңберінде логикалық, статистикалық талдау және синтездеу әдістері қарастырылған. Талдау негізінде өңірдің ғылыми әлеуетін дамыту үрдістері анықталды, барлық факторлардың синтезі негізінде тәсілдің көмегімен ғылым мен өндірістің өзара қатынасын ұйымдастырушылық тетігі құрылды.

Ғылыми кадрларды даярлаудың жай-күйі мен үрдістерін және оның моноқала халқының өмір сүру сапасына әсерін зерттеу кезінде танымның эмпирикалық жалпы ғылыми әдістері қолданылды. Бақылау әдісі және фактілерді жинау, үдерістерді нақты қабылдау арқылы мақсат ретінде, олардың ғылыми кадрларды даярлау және халықтың моноқаладағы өмір сүру сапасының жағдайын нақты түрде зерделеу ағымдағы мәселелерді анықтауға мүмкіндік берді. Қаланың (өңірдің) ғылыми әлеуетінің жағдайы мен деңгейін зерттеу осы базада депрессивті аймақтағы әлеуметтік-экономикалық тұрақтылыққа қол жеткізу тәсілі ретінде инновациялық экономика талаптарына сәйкестік дәрежесін анықтауға мүмкіндік берді.

Өңірдегі халықтың өмір сүру сапасының кешенді көрсеткішін анықтау үшін оның ғылыми әлеуетін ескере отырып, статистикалық (объективті) және әлеуметтік (субъективті) көрсеткіштерді біріктіретін жүйелі тәсіл қолданылды. Осылайша, индикаторларды жүйелеу негізінде моноқалалардағы ғылымның кадрлық әлеуетінің жай-күйі мен дамуын бағалауда олардың басымдығын анықтауға және кейіннен тиімділікті бағалаудың интегралдық көрсеткішін анықтауға мүмкіндік беретін жаңа тәсіл әзірленді.

Моноқаланың әлеуметтік-экономикалық тиімділігін арттыру үшін сценарийлік әдіс қолданылды, ол белгілі бір кезеңде халықтың өмір сүру деңгейі мен сапасына әсер ететін негізгі факторларды бөліп көрсетуге және осының негізінде факторлар иерархиясының әртүрлі нұсқаларын әзірлеуге мүмкіндік берді.

Бұл әдіс әрбір нұсқаны талдау мен бағалауды, оның құрылымдық ерекшеліктерін зерделеуді және іске асыру кезіндегі ықтимал салдарды болжап көрсетеді. Модельдеу әдісі өңірдегі ғылым мен өндірістің өзара қатынасының ұйымдастырушылық тетігін қалыптастыру кезінде қолданылған, бұл моноқалалардағы өмір сүру сапасын арттыруды басқару тетігіне барабар түзету жүргізуге мүмкіндік береді.

Зерттеу нәтижелері ғылыми кадрларды дайындау жағдайының жалпы деңгейін және тұрғындардың өмір сүру сапасын арттырудың жалпы көрінісінде арттыру жағдайын өлшеу үшін пайдаланылуы мүмкін. Тұрғындардың өмір сүру сапасын өлшеуді жаңа тұрғыдан қарастыру ұсынылады. Ғылым мен өндірістің өзара әрекеттесуінің ұйымдастырушылық механизмі өңделді, ол университет пен өнеркәсіптік ірі кәсіпорынның ғылыми әлеуетін ұштастырды.

Зерттеудің нәтижелері мен қортындысы экономиканы басқарудың аймақтық және мемлекеттік органдарымен экономиканы дамыту бағдарламаларын өңдеу барысында және тұрғындардың өмір сүру сапасы мен деңгейін анықтауда пайдаланылуы мүмкін.

Зерттеуде экономикасы өнеркәсіптік индустрияға негізделген елдер алдында тұрған өзекті әлеуметтік мәселені шешудің жолдары қарастырылып ұсынылған. Қоғамға ықпалы депрессивті аймақтардың экономикалық дамуын жеделдету және ғылыми әлеуетті нығайту негізінде өмір сапасын арттыру болып табылады. Өмір сүру сапасын қадағалау және өзгерту аймақтың әлеуметтік-экономикалық жағдайын мониторингілеудің маңызды құралы мен параметріне айналады.

Түйін сөздер: ғылыми әлеует, моноқалалар, өмір сапасы, ғылыми кадрларды даярлау, индикаторлар, механизм, ғылым мен өндірістің өзара іс-қимылы.

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ФОРМИРОВАНИЕ НАУЧНОГО ПОТЕНЦИАЛА И КАЧЕСТВО ЖИЗНИ В МОНОГОРОДАХ РЕСПУБЛИКИ КАЗАХСТАН

Аннотация. Повышение качества жизни должно основываться на развитии инновационной экономики и диверсификации через повышение научного потенциала. При этом отсутствует методология по его измерению, нет организационного механизма использования имеющегося потенциала современного производства градообразующего предприятия и вузовской науки. Цель: разработка методологических подходов и организационных мер к решению проблем повышения уровня и качества жизни населения в моногородах на основе анализа состояния и тенденций развития научного потенциала. Новая идея состоит в том, что индикатором повышения качества жизни населения в депрессивных регионах выступает кадровое обеспечение научной и инновационной деятельности.

В качестве методологической базы были использованы труды ученых, исследующих вопросы качества жизни населения в регионах (моногородах), а также проблемы научно-технического прогресса и развития научного потенциала регионов. В качестве методологического подхода использован системный подход, в рамках которого предусмотрены методы логического, статистического анализа и синтеза. На основе анализа выявлены тенденции развития научного потенциала региона, с помощью подхода на основе синтеза всех факторов создан организационный механизм взаимодействия науки и производства.

При исследовании состояния и тенденций подготовки научных кадров и влияния этого на качество жизни населения моногорода использованы эмпирические общенаучные методы познания. Метод наблюдения и сбора фактов, заключающийся в целенаправленном восприятии процессов в их реальном виде, позволил изучить текущее состояние подготовки научных кадров и качества жизни населения в моногороде, выявить имеющиеся проблемы. Изучение состояния и уровня научного потенциала города (региона) дало возможность определить на этой базе степень соответствия требованиям инновационной экономики как способа достижения социально- экономической устойчивости в депрессивном регионе.

Для определения комплексного показателя качества жизни населения в регионе с учетом его научного потенциала был применен системный подход, объединяющий статистические (объективные) и социологические (субъективные) показатели. Таким образом, выработан новый подход к оценке состояния и развития кадрового потенциала науки в моногородах на основе систематизации индикаторов, позволяющий определить их приоритетность и выявить в последующем интегральный показатель оценки эффективности.

Для повышения социально-экономической эффективности моногорода применен сценарный метод, который позволил выделить ключевые факторы, влияющие в определенном периоде на уровень и качество жизни населения и разработать на этой основе различные варианты иерархии факторов. Этот метод предполагает анализ и оценку каждого варианта, изучение его структурных особенностей и возможные последствия

при реализации. Метод моделирования применен при формировании организационного механизма взаимодействия науки и производства в регионе, что позволяет проводить адекватную корректировку механизма управления повышением качества жизни в моногородах.

Результаты данного исследования могут быть в последующем развиты для измерения общего уровня состояния подготовки научных кадров и условий для его роста в общем контексте повышения качества жизни населения. Сформирован новый подход в методологии измерения уровня и качества жизни населения. Предложен организационный механизм взаимодействия науки и производства, объединившим научный потенциал университета и промышленного градообразующего предприятия.

Результаты и выводы исследования могут быть использованы территориальными и государственными органами управления экономикой при разработке программ развития экономики и при определении уровня и качества жизни населения. В исследовании рассмотрены и предложены пути решения важнейшей социальной проблемы, остро стоящей перед странами с экономикой, основанной на промышленной индустрии. Влияние на общество заключается в ускорении экономического развития депрессивных территориях и повышения качества жизни на основе усиления научного потенциала. Отслеживание состояния и изменения качества жизни станет важнейшим инструментом и параметром мониторинга социально-экономического положения территорий.

Ключевые слова: научный потенциал, моногород, качество жизни, подготовка научных кадров, индикаторы, механизм, взаимодействие науки и производства.

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RESOURCE BASES OF THE PROVISION OF THE PROFESSIONAL HEALTH OF THE STUDENTS

Abstract. The article presents the results of research on the problem of health, saving the students of the pedagogical universities. Structural components of the professional health of the teacher were identified: cognitive, motivational-behavioral, emotional-volitional, and value-semantic. The value-semantic component is defined as the main one. A preventive program "Socio-psychological service "LIFE" has been developed, aimed at ensuring the professional health of the students at the stage of professional training for the teaching activities. The program is based on the resource approach, since health-saving activities require the subjects of the educational process to provide the resources. Resources for preserving professional health are considered as a set of the personal characteristics (internal and external), when interacting with the factors of personal burnout, can change their polarity, which affects the effectiveness of a person's professional activity and behavior in general. The following resources were defined: internal, which ensures the life of the subject, his motivation, life choices, the direction of individual activity, the solution of emerging problems; external, the resource of the immediate environment: peers, teachers, reference links, university. The content of the service's activities is revealed through its directions and forms of work, directly related to the structural components of the students. professional health and the activation of allocated resources. The analysis found the systematic inclusion of the students in various types of health-saving activities (trainings, panel discussions, sports clubs, focus groups, etc.), contributes to the activation of their internal and external resources, quite necessary for the prevention of the professional deformities and the preservation of professional health.

Key words: student youth, health, resources, quality of life, younger generation, standard of living, educational process, reference links, motivation level, training profile.

Introduction. The problem of health care of the students of the pedagogical institutions is one of their main problems in the national pedagogy and psychology of higher education. The health of the students is considered by the scientists as an integrative indicator that assesses the effectiveness of the educational process in the modern university. Within the framework of this problem, on the one hand, the students demonstrate the negative dynamics of the development of all levels of health (physical, psychological, social), and on the other hand, they act as the social group that consciously treats their health, strives to preserve it, and distribute it among the younger generation, since this value determines the level and quality of life of young people.

Discussions. In psychological and pedagogical literature (T.V. Formanyuk, V.V. Boiko, V.E. Orel, K. Maslach, etc.) a large amount of the materials has been accumulated on various aspects of the study of professional deformations of the personality: burnout, professional crises, stress, etc. The problem of studying of the professional health was researched by the scholars, such as V.A. Ponomarenko, V.A. Piskunov, A.N. Razumov. This is due to the fact that the support of the professional activities (scientific, practical, psychological and pedagogical) has changed the direction of the expert examination of the professional health to its formation and preservation. In this regard, the search and improvement of the scientific approaches have proved the effectiveness in shaping the health of the students, require their continuation and involve work in two directions: determining the essence of personal resources of the

students and their appropriate use in the prevention of professional deformities; improving the educational process at the university, aimed at training teachers with the high level of the professional health. Let's consider various approaches to the definition of "professional health", presented in the scientific works of the modern researchers (table). Each of the authors identifies its own aspects of the professional health and considers them as the key.

Definition of the "professional health" in the scientific works of the modern researchers

Author	Definition
V.A. Ponomarenko	ability of a person to activate regulatory and compensatory mechanisms within the framework of their professional activity, which contribute to improve the level of performance and the formation of professionally important qualities of the specialist.
A.G. Maklakov	set of cognitive, motivational, behavioral, and emotional components of a specialist's health that meet all the requirements for the health of the subject of professional activity as a whole, and thus ensure its high efficiency.
A.A. Pecherkina	ability of the body to activate various mechanisms (motivational, cognitive, emotional, regulatory, reflexive) that ensure human performance, the formation of personal qualities at different stages of the professional development.
O.A. Anisimova	state of the body that ensures the constructive development of the teacher's personality in the process of his professional growth, increasing the efficiency and level of competence.
T.G. Glukhova	unity of physical, mental, spiritual and moral health, the high level of development of which contributes to the effective activity and professional performance of the teacher's personality.
L.M. Mitina, G.V. Mitin	integrative characteristics, including the ability of a person to regulate their emotional health; awareness of life values; the ability to effectively interact in professional activities, as well as the level of spiritual and moral education.

The authors' lack of a single point of view, a common scientific concept that reveals the idea of the essence, forms, methods, and criteria for assessing the level of professional health formation of the students, allows us to consider this research area relevant, and continue working on its study. Based on the theoretical analysis of the literature, as well as taking into account the specifics of pedagogical activity (neuropsychiatric tension, increased responsibility, altruism, conflicts, etc.), we identify the following components as the main structural components of professional health of the teacher:

1) Cognitive component of professional health. This component of professional health includes two aspects: the features of the cognitive mental processes (professional memory, critical thinking, quick decision making, flexibility, etc.).

2) Motivational and behavioral component of professional health.

3) Emotional and volitional component of the professional health.

4) Value-semantic component of the professional health.

Based on the components of the professional health, presented by us, we consider its necessary to accompany students in the process of studying at the university in the movement from:

1) reducing the level of motivation caused by the dominance of external negative motives over internal positive ones in educational and professional activities, to the correct choice of the applicant's specialty and university, to the development of the creative potential of the individual in all spheres of life (work, family, hobbies, etc.);

2) lack of competence in the field of health care to the knowledge of a person about the features of professional health, understanding its essence, structure, role in the professional activity;

3) inertia and inaction to behavioral activity aimed at compliance with the rules of a healthy lifestyle, the use of health-saving technologies in their professional activities;

4) emotional exhaustion to the ability to manage your emotions and understand the emotional States of another person;

5) closeness and secrecy to the ability to establish and maintain contact with other subjects of the educational process.

Psychological and pedagogical support of the students in these areas is carried out at the university as the part of the program for the prevention of the professional deformations of subjects of the educational process. Prevention, in turn, is understood as a purposeful, consistent, preventive impact on students in order to preserve their professional health.

Theoretical approaches to the definition of "resources" can be divided into three groups: human potential (Formanyuk T.V. [1], Boyko V.V. [2], Orel V.E. [3]); methods of self-regulation that help overcome stress (Maslach K. [4], V Razumov A.N., Ponomarenko V.A., Piskunov V.A. [5], Karimova A.T., Sarkulov M.N., Yesengulova M.N., Gavrina A.V. [6], Kassymova G.K., Kosherbayeva A.N., Sangilbayev O.S., Schachl H., Cox N. [7], Kassymova K.G., Valeeva G.V., Muller O.Yu., Anufrieva N.V., Arpentieva M.R., Lavrinenko S.V., Dossayeva S.K. [8]); factors of success of human behavior in the process of its socialization (Maklakov A.G. [9], Pecherkina A.A., Sinyakova M.G., Churakova N.I. [10], Anisimova O.A. [11]).

The resources of the immediate environment are most often represented by the family, friends, reference groups, work colleagues, educational organizations (institutional resource). These resources can act as an additional or main reserve in achieving the person's goals and solving life problems. They neutralize the influence of destructive factors and ensure the preservation of the professional health of the person in any profession, with their positive emotions, recognition of the significance and value of their "I", a sense of confidence in the future and predictability in life situations. The opposite effect is given by low social support, which in turn causes stress in the person, thereby worsening their health. With the complex influence of external and internal resources, the degree of their impact on the subjects of the educational process increases significantly.

1) Higher education institutions, as an institutional resource in relation to the students, future teachers, have the following opportunities for organizing preventive work with the students to preserve individual components of the professional health and prevent the occurrence of professional burnout syndrome:

2) Focus of the educational process on the development of the competencies in the field of health-saving, the ability to create social projects, prevention programs using health-saving technologies.

3) Correction of students' self-esteem levels and claims for recognition in the course of academic disciplines and participation of the students in educational activities of the faculty, branch, city.

4) Practicing the skills to make informed decisions in difficult life situations, control their emotional health, not to succumb to the pressure of the others, promptly respond to any changes in the social environment.

5) Involvement of the specialists and all interested persons (teachers, psychologists, doctors) in preventive work to prevent the formation of professional deformities.

6) Social partnership with educational and social organizations of the district, city and region, whose activities are aimed at working with young people to create a healthy educational and developmental environment.

7) Using the motivational and personal potential of the students as the people, who strive for constant self-development, professional self-education, and self-realization in various spheres of life.

Results. In practice, the implementation of these directions involves the use of various types of psychological and pedagogical assistance (diagnostics, education, training, counseling, prevention) in the framework of the program "Socio-psychological service "LIFE", developed by teachers of the branch of OMSPU in Tara to prevent professional burnout and develop professional health resources of students - future teachers, at the stage of their professional training for teaching activities. This program is designed for the entire period of study of the students at the university and is built taking into account the peculiarities of the age development of the students and the organization of their educational activities. We will reveal the content of the service's activities through its directions and forms of work directly related to the structural components of the students' professional health. One of the first areas of work, in which the students are included in the activities of the service, is psychological diagnostics (Glukhova T.G.) [12].

45 % of the students show a high level of attitude to their health: they take care of their health for the sake of pleasure and results, show a cognitive interest in this problem, spread various ways of improving the body among the younger generation, and strive to create a health-saving space around them.

55% of the students are in the "risk zone": health care for them is just a necessity due to the information, received from other people on this problem, the requirements for its practical application. This category of people does not pay attention to their own health and does not care about the health of the others.

All this suggests that the pedagogical university should carry out purposeful educational work to preserve and strengthen the professional health of all subjects of the educational process. In this regard, the social and psychological service "LIFE" for first -year students is working in two directions: psychological training and psychological education (training seminars-master classes). The trainings are aimed at introducing the members of the group, developing communication skills, improving psychological stability and the development of cognitive processes. The theme of trainings is due, on the one hand, difficulties adjusting to the educational environment of the university, the discrepancy between the results of the session, the students' expectations and the increasing volume of the educational information. Training seminars allow the students to master the system of the requirements and norms, to form the skills of organizing independent work at the university.

At this stage of work, children's emotional resources are replenished, their abilities for mastering various types of activities are updated, and cognitive processes are developed, which once again emphasizes the importance of the service's work on the formation of individual components of professional health.

From our point of view, the main component of professional health is value-semantic, because if the teacher at the stage of training in higher education has formed such a universal value as health, then he will be able to form it in his students. In this case, it should be noted that under the formation of the value of "health", we mean not only a clear knowledge of the content of this category, but also compliance with this content of behaviors. The next stage of work within the framework of the value-semantic component of professional health is the holding of the dispute club "successful teacher: health, career, and self-development". In the format of a dispute club, the questions are discussed about the views of young people about the modern teacher, his professional health, factors that have a negative impact on health, career opportunities and directions of self-development. Experience shows that discussing professional health issues in this form allows the youth audience to express their opinions, hear the positions of other participants, and develop the ability to argue their point of view.

Conclusion. One of the most effective forms of interactive learning is the panel discussion. The advantage of this form of group work is to provide information on the same issue from the different sides. To organize a panel discussion on the activation of the professional health resources in the framework of the service's area of work - psychological counseling, various specialists are invited to the university: teachers, psychologists, and doctors. The work on the formation of various components of the professional health of the students and future teachers (cognitive and motivational-behavioral) will continue in senior courses as the part of various types of practices (educational, pedagogical and industrial) and the implementation of research work on this topic. Awareness of the importance of health-saving activities leads students to the desire to generalize and share their personal experience of leading a healthy lifestyle through extracurricular activities and volunteer lessons with peers [13]. For example, cognitive extracurricular activities (the cognitive component) in the form of thematic excursions, conversations, and seminars provide students with an understanding of health culture. The organization of sports events and physical training sessions (motivational and behavioral component) shows the importance of performing physical exercises for a growing body. Project work and involvement of students to participate in various competitions in this direction allow you to consolidate the knowledge gained on practical experience, and a successful result contributes to the manifestation of interest in the problem of health (cognitive, behavioral and emotional components).

Thus, a socio-psychological service "LIFE", operating on the basis of the Branch of OMGPU in Tara, as Bazhuk O.V. writes, "preserving professional health of future teachers, based on the statements. Volumes that any educational impact has a holistic effect on a person, leading physiological and psychological (emotional, cognitive, behavioural) personality changes" [14].

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СТУДЕНТТЕРДІҢ КӘСІБИ ДЕНСАУЛЫҒЫН ҚАМТАМАСЫЗ ЕТУДІҢ РЕСУРСТЫҚ НЕГІЗДЕРІ

Аннотация. Мақалада педагогикалық ЖОО студенттерінің денсаулығын қорғау мәселесі бойынша зерттеу нәтижелері берілген. Белгіленген мәселе аясында студент-жастар бір жағынан денсаулықтың барлық деңгейлерінің (физикалық, психологиялық, әлеуметтік) дамуының теріс динамикасын көрсетеді, ал екінші жағынан, өз денсаулығына ұқыпты қарайтын перспективалы әлеуметтік топ ретінде әрекет етеді әрі жоғары деңгейде сақтауға ұмтылады, өйткені бұл құндылық жастар өмірінің деңгейі мен сапасын анықтайды. Педагогтың кәсіби денсаулығының құрылымдық компоненттері: когнитивті, мотивациялық-мінез-құлық, эмоциялық-ерік, құндылық-мағыналық. Олардың негізі ретінде құндылық-мағыналық компонент анықталған.

Аталған компоненттер бір-бірін өзара толықтырады және оның өзіндік тиімділігі мен жұмысқа қабілеттілігінен көрінетін кез келген кәсіптегі адам денсаулығын сақтаудың мақсатты үдерісі болып саналады. Жоғары оқу орнында оқу үдерісінде кәсіптік денсаулық компоненттеріне сүйене отырып, студенттердің қалыптасу барысында деңгейлері мен алып жүретін бағыттары бөлінген: талапкердің оқу бейінінің және ЖОО-ның дұрыс таңдауына уәждеме деңгейін төмендету; кәсіптік денсаулық ерекшеліктері туралы адамның біліміне денсаулық сақтау саласындағы біліктіліктің жеткіліксіздігі; мінез-құлық белсенділігіне инерттілік пен әрекетсіздік; өз эмоцияларын басқару қабілетіне эмоционалдық сарқылу; білім беру үдерісінің басқа субъектілерімен қарым-қатынас орнату және қолдау біліміне тұйықтылық және жасырындылық. Осы бағыттар бойынша студенттерді психологиялық-педагогикалық сүйемелдеу ЖОО-да кәсіби деформацияның алдын алу бағдарламасы шеңберінде жүзеге асырылады.

Осы көрсеткіштерді болжау студенттерге олардың кәсіби денсаулығын сақтау мақсатында қызмет етеді және дәйекті, алдын ала әсер ету ретінде қарастырылады. Педагогикалық қызметке кәсіби дайындық кезеңінде студенттердің кәсіби денсаулығын қамтамасыз етуге бағытталған «LIFE әлеуметтік-психологиялық қызметі» профилактикалық бағдарламасы әзірленді. Бағдарламаның негізіне ресурстық тәсіл алынған, өйткені денсаулық сақтау қызметі білім беру үдерісінің субъектілерінен ресурстық қамтамасыз етуді талап етеді. Кәсіби денсаулықты сақтау ресурстары тұлғаның даму факторларымен өзара іс-қимыл жасағанда өзінің қайшылығын өзгерте алатын, адамның кәсіби қызметінің тиімділігіне және оның жалпы мінез-құлқына әсер ететін жеке тұлғалық ерекшеліктердің (ішкі және сыртқы) кешені ретінде қарастырылады. Ресурстар ретінде мыналар анықталды: субъектінің тыныс – тіршілігін қамтамасыз ететін ішкі, оның уәждемесі, өмірлік сайлау, жеке белсенділіктің бағыттылығы, туындайтын проблемаларды шешу; жақын ортаның сыртқы-ресурсы: құрдастары, педагогтар, референттік байланыстар, жоғары оқу орны.

Жоғары оқу орны студенттермен кәсіптік денсаулықтың жекелеген компоненттерін сақтау және кәсіби даму синдромының туындауының алдын алу бойынша алдын ала жұмыстарын ұйымдастыру үшін келесі мүмкіндіктерге ие: оқу-тәрбие үдерісінің денсаулық сақтау саласындағы құзыреттілікті дамытуға бағыттылығы; студенттердің өзін-өзі бағалау деңгейін түзету және оқу пәндері барысында мойындауға деген талаптар және студенттердің тәрбиелік іс-шараларға қатысуы; өмірлік қиын жағдайларда ойластырылған шешімдер қабылдау, өзінің эмоционалдық жағдайын бақылау; кәсіби деформациялардың қалыптасуының алдын алу жұмыстарына мамандарды тарту; салауатты білім беру және дамыту ортасын құру мақсатында жастармен жұмыс істеуге бағытталған білім беру және әлеуметтік ұйымдармен әлеуметтік серіктестік; студенттердің тұрақты өзін-өзі дамытуға ұмтылатын адам ретінде мотивациялық және жеке әлеуетін пайдалану. Іс жүзінде аталған бағыттарды іске асыру психологиялық-педагогикалық көмектің әртүрлі түрлерін (диагностика, ағарту, тренингтер, кеңес беру, алдын алу) пайдалануды көздейді.

Студенттердің кәсіби денсаулығының құрылымдық компоненттерімен және бөлінген ресурстарды белсендірумен тікелей байланысты оның бағыттары мен жұмыс түрлері арқылы қызметінің мазмұны ашылды. Жүргізілген талдау барысында студенттерді денсаулық сақтау қызметінің әр түріне жүйелі түрде енгізу (тренинг, панельдік пікірталас, спор-клуб, фокус-топтар және т.б.), кәсіби деформациялардың алдын алу және кәсіби денсаулықты сақтау үшін қажетті ішкі және сыртқы ресурстарды белсендіруге ықпал ететіні анықталды. Студенттердің барлық аталған іс-шаралар мен әлеуметтік-психологиялық қызмет жұмысының түрлеріне қатысуы оларға кәсіби денсаулықты сақтауға ықпал ететін өзінің ішкі және сыртқы ресурстарын белсендіруге мүмкіндік береді.

Болашақ педагог – студенттердің конструктивтік ресурстарының қалыптасу деңгейін бағалау үшін кәсіби деформацияның алдын алу және кәсіби денсаулықты сақтау бағдарламасын өткізгеннен кейін А.А. Деркач, А.К. Маркованың психологиялық-педагогикалық әңгімелесу әдістемесі қолданылады. Әдістеме нәтижелерін талдау педагогикалық ЖОО студенттерінің 80%-да осы компоненттердің қалыптасуының жоғары деңгейін растайды, бұл студенттерді педагогикалық ЖОО-да барлық оқу мерзімінде қызметтің алдын алу бағдарламасына қосу қажеттілігі туралы қорытынды жасауға мүмкіндік береді. Бағдарламаның ерекшелігі шекараның болмауы және педагогтың кейінгі барлық кәсіби қызметі бойынша оны іске асыруды жалғастыру мүмкіндігі болып саналады.

Түйін сөздер: студент жастар, деңсаулық, ресурстар, өмір сапасы, өскелең ұрпақ, өмір сапасы, білім беру процессі, референтті байланыстар, мотивация деңгейі, оқу бейімі.

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РЕСУРСНЫЕ ОСНОВЫ ОБЕСПЕЧЕНИЯ ПРОФЕССИОНАЛЬНОГО ЗДОРОВЬЯ СТУДЕНТОВ

Аннотация. В статье представлены результаты исследования по проблеме здоровья сбережения студентов педагогического вуза. В рамках обозначенной проблемы студенческая молодёжь, с одной стороны, демонстрирует отрицательную динамику развития всех уровней здоровья (физического, психологического, социального), а с другой стороны – выступает как перспективная социальная группа, которая бережно относится к своему здоровью, стремится сохранить его на заданном уровне, распространить среди подрастающего поколения, так как данная ценность определяет уровень и качество жизни молодёжи. Выделены структурные компоненты профессионального здоровья педагога: когнитивный, мотивационно-поведенческий, эмоционально-волевой, ценностно-смысловой.

В качестве основного определен ценностно-смысловой компонент. Перечисленные компоненты взаимодополняют друг друга и представляют собой целенаправленный процесс сохранения здоровья человека любой профессии, выражающийся в его самоэффективности и работоспособности. Исходя из представленных компонентов профессионального здоровья в процессе обучения в вузе выделены направления сопровождения студентов в движении от: снижения уровня мотивации к правильному выбору абитуриентом профиля обучения и вуза; недостаточной компетентности в области охраны здоровья к знанию человека об особенностях профессионального здоровья; инертности и бездействия к поведенческой активности; эмоционального истощения к умению управлять своими эмоциями; замкнутости и скрытности к умению устанавливать и поддерживать контакт с другими субъектами образовательного процесса.

Психолого-педагогическое сопровождение студентов по данным направлениям осуществляется в вузе в рамках программы профилактики профессиональных деформаций. Профилактика рассматривается как целенаправленное, последовательное, превентивное воздействие на студентов в целях сохранения их профессионального здоровья. Разработана профилактическая программа «Социально-психологическая служба «LIFE», направленная на обеспечение профессионального здоровья студентов на этапе профессиональной подготовки к педагогической деятельности. В основу программы положен ресурсный подход, поскольку деятельность по охране здоровья требует от субъектов образовательного процесса ресурсной обеспеченности.

Ресурсы сохранения профессионального здоровья рассматриваются как комплекс личностных особенностей (внутренних и внешних), которые при взаимодействии с факторами выгорания личности, могут изменять свою полярность, что сказывается на эффективности профессиональной деятельности человека и его поведении в целом. В качестве ресурсов определены: внутренний, обеспечивающий жизнедеятельность субъекта, его мотивацию, жизненные выборы, направленность индивидуальной активности, решение возникающих проблем; внешний – ресурс ближайшего окружения: сверстники, педагоги, референтные связи, вуз.

Высшее учебное заведение обладает следующими возможностями для организации профилактической работы со студентами по сохранению отдельных компонентов профессионального здоровья и предупреждению возникновения синдрома профессионального выгорания: направленность учебно-воспитательного процесса на развитие компетенций в сфере охраны здоровья; коррекция уровней самооценки студентов и притязаний на признание в ходе учебных дисциплин и участия студентов в воспитательных мероприятиях; отработка умений принимать обдуманные решения в трудных жизненных ситуациях, контролировать свои эмоциональные состояния; привлечение специалистов к профилактической работе по предупреждению формирования профессиональных деформаций; социальное партнерство с образовательными и социальными организациями, деятельность которых направлена на работу с молодёжью, с целью создания здоровой образовательной и развивающей среды; использование мотивационного и личностного потенциала студентов как людей, стремящихся к постоянному саморазвитию.

На практике реализация названных направлений предполагает использование различных видов психолого-педагогической помощи (диагностика, просвещение, тренинги, консультирование, профилактика). Раскрыто содержание деятельности службы через её направления и формы работы, непосредственно связанные со структурными компонентами профессионального здоровья студентов и активизацией выделенных ресурсов. В ходе проведенного анализа установлено, что систематическое включение студентов в разные виды здоровье охраняющей деятельности (тренинги, панельные дискуссии, диспут клубы, фокус-группы и др.), способствует активизации их внутренних и внешних ресурсов, необходимых для профилактики профессиональных деформаций и сохранения профессионального здоровья. Участие студентов во всех перечисленных мероприятиях и формах работы социально-психологической службы позволяет им активировать свои внутренние и внешние ресурсы, способствующие сохранению профессионального здоровья.

Для оценки уровня сформированности конструктивных ресурсов студентов – будущих педагогов, после проведения программы профилактики профессиональных деформаций и сохранения профессионального здоровья используется методика психолого-педагогического собеседования А.А. Деркача, А.К. Марковой, которая позволяет выявить психолого-педагогические качества и свойства студентов: профессиональную мотивацию и профессиональные способности. Анализ результатов методики подтверждает высокий уровень сформированности данных компонентов у 80% студентов педагогического вуза, что позволяет сделать выводы о необходимости включения студентов в профилактическую программу службы на протяжении всего времени обучения в педагогическом вузе.

Особенностью программы является отсутствие границ и возможность продолжения её реализации на протяжении всей последующей профессиональной деятельности педагога.

Ключевые слова: студенческая молодёжь, здоровье, ресурсы, качество жизни, подрастающее поколение, уровень жизни, образовательный процесс, референтные связи, уровень мотивации, профиль обучения.

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EUROPEAN EXPERIENCE OF TRAINING OF FUTURE TEACHERS OF FOREIGN LANGUAGES: FINDINGS AND PROSPECTS FOR UKRAINE

Abstract. The aim of the paper is to analyze the peculiarities of training of future foreign languages teachers of some European countries and generalize the useful European experience, which can be recommended as prospects for improving the training of future foreign languages teachers in Ukrainian higher educational establishments. The study was conducted using methods of analysis, synthesis, generalization, comparative analysis and predictive methods**.**

The main focus of this study is on the analysis of the experience of training future teachers of foreign languages in higher educational institutions in the following European countries: Germany, France, Poland, Switzerland, Italy, the Czech Republic, Hungary, Finland, Estonia. A comparative analysis of the system of foreign language education in European countries allowed the authors to identify general and specific features of the training of future teachers of foreign languages in European countries, as well as highlight the models in the structure of training of future teachers of foreign languages: Bachelor-teacher, Bachelor-linguist, Master, which indicates the wide variability and dynamism of the development of the training system of future teachers of foreign languages in Europe. The generalization of the European experience in the training of future teachers of foreign languages gave the authors the opportunity, to find out fundamentally important directions, to formulate the main recommendations as the prospects for improving the training of future teachers of foreign languages at Ukrainian higher educational establishments at the level of educational policy of Ukraine.

Key words: training, future teachers of foreign languages, European countries, foreign language education, higher educational establishments.

Introduction. Structural changes in the socio-economic life in the majority of countries put forward new requirements for the organization of educational process in higher education. Integration of the Ukrainian education system into European space, accession to the Bologna Declaration, implementation of a competency approach have led to radical changes in the educational process of future foreign language teachers, which include the emphasis from theoretical training to practical one; formation of cultural, socio-cultural and instructive competences of a future foreign language teacher; transformation of methodology into a complex, multidimensional and interdisciplinary science; expanding the national and cultural aspects of future teacher training; the use of information and communication technologies for studying a foreign language; introduction of innovative pedagogical technologies in the educational process of universities.

However, Ukrainian higher educational establishments face a range of challenges: decrease in the number of academic hours in the professional training cycle, slow development of international academic mobility of students from foreign language faculties, insufficient cooperation of universities with internship bases; unreadiness of supervisors to work in the aspect of competency assessment (in some cases, the school administration appoints practically inexperienced teachers as heads of internship); low salary of English teachers **(**Bezliudna, 2016). At present, new understanding of the directions of professional training in the pedagogical university is required, ensuring the quality of pedagogical training

of the students from the point of view of requirements for future professional activity (Drobotenko, Duka, Kurdumanova, Chekaleva, Sharov, & Dyrka, 2019).

That is why, comprehension of the structure, content and organizational features of foreign language education system of European countries is of great importance for Ukraine. In this regard, the study and generalization of European experience is being updated.

The aim of the paper is to analyze the peculiarities of training of future foreign languages teachers of some European countries and generalize the useful European experience, which can be recommended as the prospects for improving the training of future foreign languages teachers in Ukrainian higher educational establishments.

Research methods. To reach the aim of the research, the following methods were used: a) theoretical methods: analysis; synthesis; generalization of theoretical bases (for clarifying peculiarities and specificities of training future teachers of foreign languages of some European countries); b) comparative analysis (for the possibility of comparing the organization, functioning, development of foreign language education system in the European countries); c) predictive methods (for accentuation of fundamentally important directions as prospects for improving the training of future foreign languages teachers in Ukrainian higher educational establishments.

Discussion. About 75 per cent of the world's population speak, in one level or another, two or more languages (multilingualism, bilingualism). About one-quarter of the countries on the Earth officially recognize two languages as state ones, a few countries – three or more languages and the actual number of coexisting languages in many countries is much more significant (Vasic, Kussanova, Summers, Maydangaliyeva, 2012). In view of this, training of future teachers of foreign languages (FTFLs) for professional activity is one of the most important function of the majority European higher educational establishments (HEEs) in this regard. The main types of educational establishments in the countries under the study are: general higher schools, higher pedagogical schools, specialized colleges (Germany), universities, Grand schools (France), universities, state universities (Switzerland), teacher training institutes, institutes, universities (Hungary), universities, teacher training colleges (Austria), collegiums, higher professional schools, academies (Poland), universities (the Czech Republic). The training in different countries has its own peculiarities and specificity.

The experience of training of FTFLs in **Germany** arouses the considerable interest in these areas. Such training is carried out in 51 HEEs, among which 6 pedagogical universities in the cities of Freiburg, Heidelberg, Karlsruhe, Ludwigsburg, Schwebisch Gmund and Weingarten. The most common foreign language is English, while French is studied in 42 educational institutions, Spanish – in 36, Italian – in 26, Greek – in 24, Russian – in 21. Only in some HEEs students study Polish, Czech, Danish, Turkish, Norwegian, Dutch and Swedish (Bazova, 2011).

The multi-level system of the training of FTFLs provides passing three stages of study: *the undergraduate stage* covers 6 semesters and aims to study two main subjects, as well as elective subjects. At this stage, students intensively study the didactics of the subjects they selected at the beginning of their training, and practice in school; *Master's stage* covers 4 semesters and ends with a state exam and writing a master's paper; at the *stage of advanced training* the teacher is obliged to carry out throughout students' professional activities in order to update and expand their competencies. Future foreign languages teachers usually master two specialties, not necessarily related, combining the study of two foreign languages; other combinations are also possible, for example, mother tongue and foreign language, foreign language and non-philological specialty – mathematics, biology, economics, etc. Students study the disciplines of the scientific and professional direction, namely: Linguistics, Literature and Literary Criticism, Language Practice and Local History (Kolesnichenko, 2013). The teaching process requires the obligatory practical activities of future teachers at school (conducting practical classes, internship). Therefore, training of FTFLs is inextricably linked to the acquisition of competencies and knowledge: thorough knowledge of foreign languages, the processes of teaching and learning foreign languages; knowledge of socio-linguistic and pragmalinguistic aspects of the language and methods of their application; knowledge of the history, geography and culture of the language they study. It should be noted that training of FTFLs in Germany is mainly focused on the linguistic component in teaching students; an undoubted advantage of such training is a developed system of internships.

Today, **France** holds the world record for the number of FTFLs. Government of the country considers a teacher of foreign language to be a guarantor of spreading foreign language and culture

abroad. Future foreign language teachers are being trained at universities and pedagogical institutes. Students pass several levels of training: university, methodical, pedagogical and professionally-competent one. The analysis of these levels shows that the professional-competent approach is the most effective among them, it combines academic, pedagogical and methodological training.

In France, there is no significant boundary between secondary and higher education; a characteristic feature of the French higher education system (any post-secondary education is based on a Bachelor's level) is the diversity of higher education institutions. They are mainly divided into two types: universities and Grand schools (Sysoyeva, 2012 : 163–164). Grand schools (Grandes écoles) are elite, usually commercial, higher education institutions with limited admission. After receiving a Bachelor's degree and after studying in two-year "preparatory classes" (classes préparatoires aux Grandes écoles), a student has the opportunity to study after passing a serious competition. The duration of study is 3-5 years. After graduating from the High School, the student receives a Master's degree.

The professional development of a FTFLs is largely facilitated by the variety of forms and methods of teaching, the predominance of practical classes over lectures, the use of innovative and information technologies in teaching, the undertaking a foreign internship (Gordiyenko, 2009). Academic mobility is of particular importance for future professionals in the field as one of the main components of professionalism, opening unlimited opportunities in building their own educational path. In France, the training of FTFLs is determined by the basic training which encompass a thorough knowledge of communication and technical skills, knowledge of the cognition process, knowledge of general psychology and age psychology, cultural studies, theory of pedagogy, knowledge of national education system, humanities disciplines and knowledge of several foreign characteristics (Holotiuk, 2009). In general, the formation of FTFLs is largely facilitated by innovative approaches to the organization of the educational process (the predominance of practical classes over lectures, a large number of modules aimed at the development of creative personality abilities, online conferences, academic mobility, pedagogical training).

The training of FTFLs in **Italy** is distinguished by raising the level of language competence of professionals to the threshold level (B1), as well as learning the methodology of language teaching. One of the key aspects of the content training of specialists in the field is the correlation of linguistic and methodological blocks, which implies the possession of linguistic, methodological, psychological and intercultural competences. The use of traditional forms of education and modern interactive technologies contribute to the development of critical thinking of students, research competence, motivation for self-improvement in the professional field (Calabrese, & Dawes, 2008: 38). Besides, in Italy significant experience has been gained in the implementation of international educational projects that open the prospects for cooperation between Italian and other European universities and create favourable conditions for the mobility of students and teachers (Shuinshina, Zhakupov, Burunbetova, & Dogru, 2018). Thus, in Italy, the training of FTFLs is characterized by the integration of linguistic and methodological blocks, academic mobility, as well as a focus on improving the qualifications of teachers in the pre-service system.

The training of FTFLs in **Switzerland** takes place in state universities, including the classical cantonal universities in Basel, Berne, Fribourg, Geneva, Lausanne, Neuchâtel, Zurich and 2 small cantonal universities of St. Gallen. Higher school consists of two sectors – university sector and professional one. The non-university type is narrow-specialized and closely related to professional activities. This is generally a four-year study program, which can last six years, depending on the faculty.

Those holders of Bachelor's degree, who have English language proficiency at level C1 and C2 of the CEFR (Common European Framework of Reference for languages), are enrolled to Swiss universities, indicating the orientation of the language policy of the country to European standards and the usage of competency-based approach. These individuals successfully mastered all courses of bachelor program and defended their theses or fulfilled other prescribed requirements for certification. Training of Masters in English language and literature at universities in Switzerland has been founded and proved on structural, organizational and content levels. It was formed in consideration of following concepts: international and intranational document base of higher education organisation in the country; cooperation between higher education institutions; admission peculiarities to higher education institutions; Master training programs on the base of Bachelor's degree. Master training of English philologists at these universities is characterized by the formation of students plurilingual competence including knowledge mastering in the

field of linguistics, assimilation of culture, experience acquirement in listening through comparative phonetic analysis of languages, mastering of interactivity means, constant dialogue with language speaker and creating awareness in second language acquisition (Zasluzhena, 2016). The system of organization of teaching practice belongs to the advantages of training of FTFLs in the country, it is characterized by a gradual complication of the tasks and maintaining continuity between the individual stages. The acquisition of practical skills is supported by theoretical training, which is realized through attending seminars. Practical training includes introductory practice in the first semester, practical lectures during the second and third semesters, conducting practical classes in the fourth semester and mutual visits throughout all semesters (Markheva, 2015: 258).

In **Hungary**, the training of FTFLs is carried out on the basis of pedagogical institutes, institutes and universities. The country has introduced a system of unified requirements for discipline-specific standards for higher pedagogical education. Training of FTFLs in Hungary is distinguished by the fact that considerable attention is paid to career guidance work with young people. The problem of professional suitability diagnosing and professional selection of FTFLs in Hungary has found a solution by passing an entrance exam to a magistracy, the main purpose of which is to check the motivation of FTFLs and identify the value orientations which guide applicants choosing one or another specialty (Kozubovska, Levrints, 2011: 130). Career guidance work with students of the faculties of foreign languages takes place in the process of studying practically oriented courses of teaching foreign languages, psychology and pedagogy, which are designed to form the motivation of future teachers. In Hungary, foreign language philologists at the Bachelor's level study according to a unified curriculum (with the exception of courses in teaching foreign languages, psychology and pedagogy), so the professional selection at the end of the bachelor's program is quite timely due to the fact that the main professional-pedagogical, methodological and practical training of FTFLs takes place in the magistracy.

An important achievement of the Hungarian teacher education system is the student portfolio that includes a variety of authentic materials collected during pedagogical practice and seminars in professional disciplines, the purpose of which is to demonstrate the development of professional and pedagogical competencies by FTFLs. The formation of students' high-level speech and communicative competence has a prominent place during studying in the faculties of foreign languages. In particular, students are intensively trained for the language exam at the "C" level (advanced level) at the practical courses of foreign languages during the first year of study in the HEEs. Students who fail the exam after the first year of training cannot continue their studies (Kozubovska, & Levrints, 2011: 131). Those students of foreign languages faculties who have consciously chosen the pedagogical direction of education when entering the magistracy have the possibility to attend pedagogical practice. It helps to improve the quality of vocational education and the formation of motivation for pedagogical activity. So, the positive aspect of training of FTFLs in Hungary is career guidance work with young people, the purpose of which is to diagnose the professional suitability of future teachers.

In a situation of comprehensive development in **Poland**, the knowledge of foreign languages, mainly English, has become an important component of the professional activity of Poles. The training of FTFLs in Poland is provided by pedagogical colleges of foreign languages (including collegiums of the English language), higher professional schools, universities, academies and polytechnic schools (Derkach, 2011). A positive phenomenon is the introduction of three-level system of education at universities. First level studies – four-year engineer programmes or three-year bachelor programmes – are focused on preparing graduates for a particular profession. The essential element of these programmes is 15-week practice. The graduates are entitled to continue education at supplementary two or two-and-a-half-year *master's* courses. Teacher training also takes place at *tertiary* level and can be considered as a vocational one (Vocational education and training in Poland, 2011: 33). The normative document "Standard for the Professional Training of Foreign Language Teachers" (2006) defines the minimum requirements for the content, scope, competences and level of a foreign language teacher training which is adapted to European requirements and includes six parameters: 1) general requirements; 2) characteristics of a graduate; 3) competences of a foreign language teacher; 4) groups of subjects; 5) the content of educational disciplines; 6) goals and requirements for the implementation of psychological and pedagogical practice in school.

In order to improve the training of FTFLs in accordance with European standards, mandatory basic general foreign language examinations at B2 level were introduced at the first stage of study, criteria for

assessing the quality of the foreign language learning process, the procedure for training and production practice of students were developed (Zahoruiko, 2015). Teacher training for the profession takes place in three directions: 1) scientific – in the context of the content of training; 2) pedagogically methodical – in the context of forms, methods and means of labour; 3) methodological – relates to innovative and research functions that make up a complementary integrity (Shemprukh, 2001). Graduates from foreign language teacher training colleges obtain qualifications entitling them to teach a foreign language in primary, lower and upper secondary schools. Other teacher colleges prepare teachers for kindergartens, primary schools and other educational establishments, over three years (Vocational education and training in Poland, 2011: 33).

So, foreign-language education in Polish HEEs expands the professional capabilities of future foreign languages teachers and serves to increase the effectiveness of their professional activities, providing such properties of the learning process as the intensification and optimization of students' studying educational material.

Another European country, which experience of training of FTFLs is worth studying is **the Czech Republic**. The peculiarity of the FLTT programs in the country is the implementation of the "European Dimension", based on defining the study of European specificity in the content of individual disciplines of the curriculum; recognizing the need to ensure the implementation of the Bologna Process and relevant quality standards for education; the development of training courses enabling teachers to be qualified in several countries; participation in European projects and student mobility; establishing interstate and inter-university agreements (Kuznetsova, 2009: 67). The theoretical component of teacher education includes the study of pedagogy, general educational psychology and sociology. The common practice is to specialize students in two subjects and one foreign language in combination with any other discipline (it can be second foreign language). Czech universities encourage students to learn second foreign language, believing that it provides opportunities for future teachers to avoid difficulties in working with students. However, there are some limitations in choosing foreign languages to study. If a student chooses to study a less-commonly taught language, the second one provided in the curriculum is English, French or German.

In accordance with European requirements, three-tier model of training of FTFLs has been introduced in Czech higher education institutions. Education of the first level of higher education refers to Bachelor's degree (3 years), the second level refers to magistrate (2 years) and the third one refers to doctoral studies (3-5 years). All students take courses in history, literature and culture of the language they study. A compulsory component of training of FTFLs is the grammar study. The content of the training includes courses in linguistics, sociolinguistics, psycholinguistics. Students acquire knowledge of foreign language teaching methods; the term and extent of such training varies, but it is focused on the teacher's preparations to the pupil's learning process and implementing a communicative approach to foreign language learning (Antonenko, 2015: 74).

Noteworthy is the fact that the program of training of FTFLs in higher educational establishments of the Czech Republic in the last decade has significantly changed in the direction of emphasis on methodological and didactic disciplines, especially Special and Social Pedagogy. A new structure of pedagogical practice was introduced to deepen professional and teaching skills for undergraduate students. It should be noted that the student, in addition to teaching at school, becomes an assistant of the teacher and helps him in the preparation of lesson plans, tutorials, excursions, projects, participates in teacher-parent conference and duty shifts in the school. The student becomes fully involved in the school work, daily activities of the teacher, administrative work, etc. After completing the practice, students submit a report and discuss current issues at the tutorial seminar with University teachers and a specialist in didactics (or psychology). Thus, globalization and European integration processes have contributed to the improvement of the curricula of training of FTFLs in HEEs in the Czech Republic.

The experience of training of FTFLs in **Austria** is also valuable for our study. The Austrian Government was one of the first to develop a program of training of FTFLs based on a competency-based approach. The decision to use the curriculum based on a competency-based approach in Austrian universities is aimed at achieving professional competency that includes discursive, linguistic, socio-cultural and strategic competencies. It should be noted that Austrian universities and pedagogical colleges offer studying courses in 30 foreign languages. Teaching in English, German and French is of great priority while Spanish, Italian, and Russian are less popular languages (Teacher Education Policy in Europe, 2008: 15). In addition, universities offer the widest range of languages for the teaching less-

commonly taught languages, but the demand for these languages is low due to the fact that not all countries offer their studying in the school system.

The peculiarity of teacher training in Austria lies, first and foremost, in the "academic freedom" of the student, which is manifested in the fact that not only universities or colleges are autonomous entities, but each student is given freedom and autonomy. It is not obligatory for FTFLs to attend classes with their classmates, they may choose the relevant curriculum and organize their studying and free time according to general requirements. After enrolment, students themselves make plans for their work during the studying period, independently plan their academic life, and choose the disciplines they study, the exam subjects and term of study. Students have the right to attend lectures, seminars, do an internship at convenient time, as well as to have a side job. Foreign students and migrants can change their curriculum. The curricula of Austrian universities and pedagogical colleges contain a very small number of compulsory subjects, it allows students to work individually most of the time. Along with the required courses, approximately 40 per cent of courses are special and optional ones. Much attention is also paid to practical classes and independent work of students. In particular, each in-class hour is supplemented by 2–5 hours of independent work. The types of independent work include writing abstracts, free topic essays, creative comparative tasks, critical analysis of articles, implementation of individual and group research projects (Byndas, 2016: 119-121).

The specificity of training of FTFLs is that in addition to traditional types of practical training (pedagogical practice at school, practice at summer or language camps, educational and industrial practice) graduates of Austrian HEEs have an "internship teaching" at school. During this period, a graduate is called an intern. Such internship teaching is defined as the process, when future educators receive support in demonstrating their skills and abilities during the first year of teaching. This educational model is positioned as a model for providing a higher level of teacher training that stipulates pedagogical support and improvement of teachers' skills. In addition, Austrian higher educational establishments pay great attention to the academic mobility formation of future teachers. This process is purposeful, managed and systematic, including a step-by-step introduction to the social phenomenon of academic mobility; acquiring knowledge and skills; acquisition of foreign language activities. Academic mobility of Austrian students is ensured by the possibilities of choosing a specialty (specialization) within one direction of specialists' training; individual formation of training programs through the choice of subjects that relate to elective disciplines; simultaneous (parallel) training in different programs (Byndas, 2016: 142).

Special attention is paid to the training of FTFLs for primary school in the Scandinavian countries (Finland) and the Baltic countries (Estonia). The last few years the education system in **Finland** is constantly at the centre of international attention due to the excellent results that Finnish schoolchildren demonstrated in the "Programme for International Student Assessment" (PISA). Finland not only headed the list, it became the only European country among the world leaders (Shuinshina, Zhakupov, Burunbetova, & Dogru, 2018: 119). The Federation of Foreign Language Teachers of Finland recommends a foreign languages teacher to be involved in the work with children (grades 1–6) from the freshman year (Kantelinen & Pollari, 2008: 20). This phenomenon is explained by the high requirements for students' foreign language skills at different levels of education. The content of training of FTFLs is represented by theoretical and practically oriented disciplines. In particular, the Master's degree program in Early Childhood Language Education and Intercultural Communication includes such subjects as Mastering a Foreign Language, European Language Portfolio for Children, Theory and Practice of Early Foreign Language Learning, Research on Foreign Language Teaching and others. The training of FTFLs for a primary school in Finland is characterized by a special approach to curriculum development in a multi-level education system, high qualification requirements for a future specialist, practice orientation and ability to insert foreign languages subjects in the school integrated educational environment.

The educational goal in **Estonia** is to train a foreign languages teacher, who can use language as a means of children development. The program of early language learning in this country is implemented as a part of training of elementary and pre-school teachers at Bachelor's degree. In humanitarian course students are offered to choose specialties "Teacher of English in primary school" or "Teacher of English at preschool institution" depending on their primary speciality (Raud, 2008). The content of the educational program includes courses of linguistic disciplines and general teaching methods (Practical Phonetics,

Lexicology, Academic Writing, etc.). The main emphasis is done on the individual-creative orientation of studying; the educational process is designed so that students are engaged in research most of the time. The specialty practice within the curricula is an integral part of the future teacher's professional training, during which students go through several stages from observing the learning process to active teaching activities in a team with a mentor teacher. So, the training of FTFLs in Estonia is characterized by: the inclusion of the elective courses of the special module in the Bachelor's educational program with particular emphasis on linguistic and methodological training.

On the whole, the content of the training of FTFLs in all countries is characterized by a combination of theoretical and practical blocks of pedagogical, linguistic and methodological directions. The amount of special disciplines in the blocks varies. In a number of countries students have school practice at the final stage of study (Austria, Germany, France, the Czech Republic, Hungary); in other countries students are gradually involved in teaching at all stages of the educational program (Finland).

Findings. Generalization of European experience of training of FTFLs allows us to distinguish *models* (figure 1) in the structure of training of FTFLs:

- Bachelor-teacher (with additional knowledge of foreign language). The model is especially prevalent in Austria, Finland, Germany, Hungary, Estonia, Poland.
- Bachelor-linguist (with additional qualification in education). The model is vividly represented in the Czech Republic, Italy, Switzerland.
- Master. The model is especially developed in Poland, Hungary, the Czech Republic, Finland, France, Switzerland.

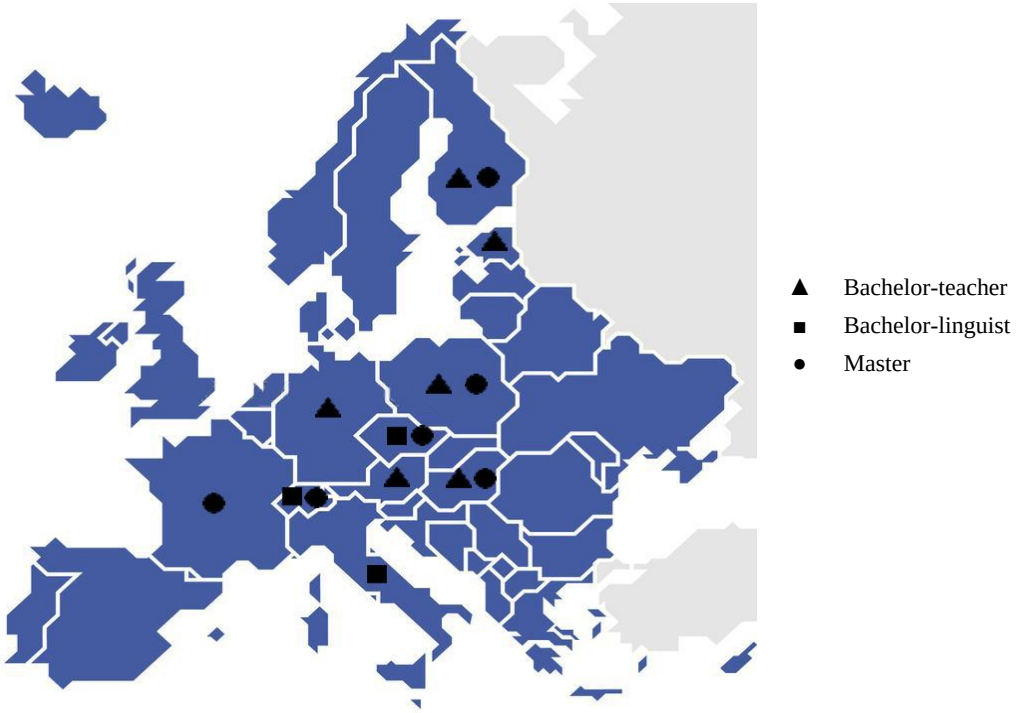

Figure 1 – Models of training of FTFLs in European countries.
Note: Compiled by the authors on the basis of the generalized European experience

The variety of models testifies to the wide variability and dynamism of the development of training system of FTFLs in the modern world. Undoubtedly, such international experience is a valuable resource for the amplification and saturation of training of FTFLs in our country.

The analysis of the training of FTFLs in European countries has revealed the general and specific features, presented in figure 2.

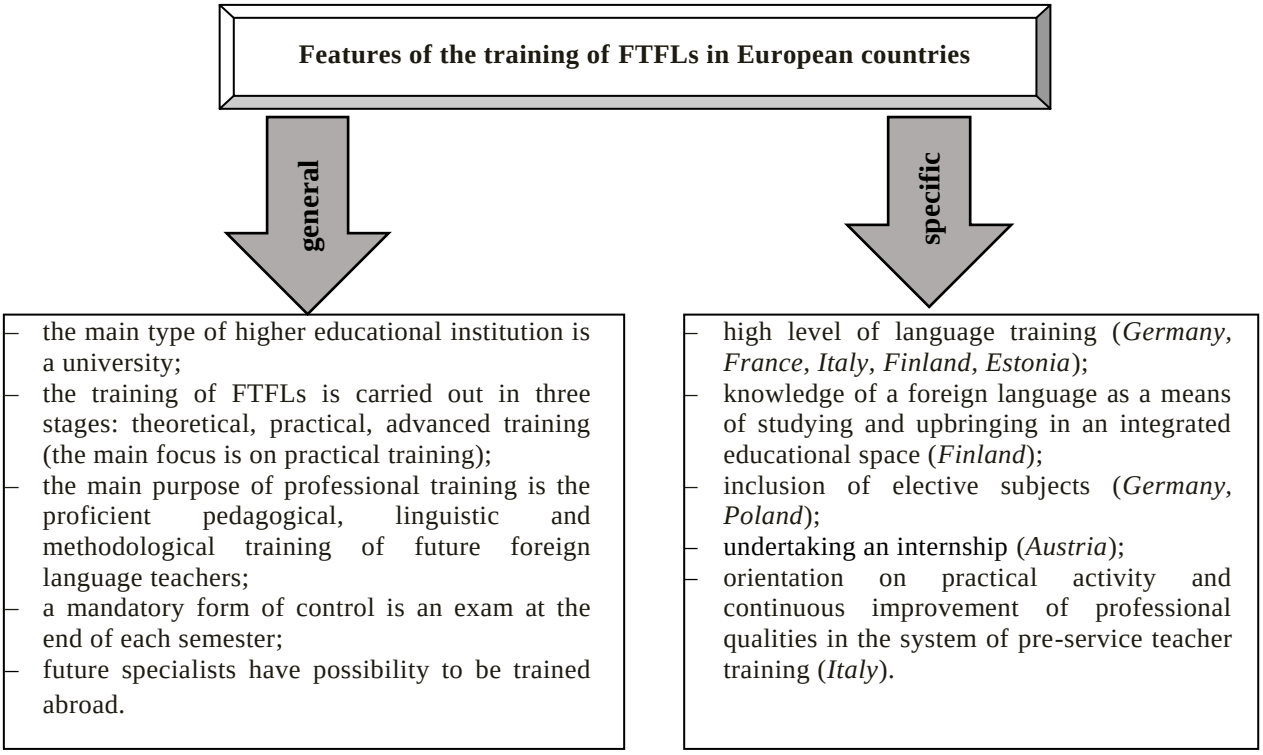

Figure 2 – Features of the training of FTFLs in European countries.
Note: Compiled by the authors.

Conclusions. Comparative analysis of the training of FTFLs in European countries (Germany, France, the Czech Republic, Austria, Hungary, Poland, Finland, Estonia, Italy) gives us a valuable opportunity to accentuate three fundamentally important directions, which we recommend as prospects for improving the training of FTFLs in Ukrainian HEEs.

The accent of education policy should be done on:

– possibility to get several degrees of teacher education, and, accordingly, several diplomas in higher pedagogical education, it will give the school administration an opportunity to differentiate the teaching function of the future teacher, to create natural personnel competition and to select the most qualified professionals;

– activation of practical training of a future teacher up to the referendum system, when obtaining a diploma of education is associated not with passing exams and final research paper defence, but with the successful post-graduate internship at school, where a teacher proves that knowledge and competences obtained are actually applicable and school receives a qualified specialist;

– raising the social status of teaching profession, manifested in the ability to realize career growth through the development of teacher's own (and at his own expense) professional competencies that increase the status of a teacher and his salary, availability of competition in teaching; advanced functions of professional activity of a future teacher (researcher, analyst, diagnostician, educator, psychologist, tutor, project coordinator, social worker, organizer).

Understanding conceptual principles of training of future foreign languages teachers in European countries, selection of the best features of the experience and implementation them into educational system of training of future foreign languages teachers at Ukrainian universities will upgrade the quality of pedagogical training of the students and refine the education system of the country.

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ШЕТ ТІЛІНІҢ БОЛАШАҚ МҰҒАЛІМІН ОҚЫТУДЫҢ ЕУРОПАЛЫҚ ТӘЖІРИБЕСІ: УКРАИНАҒА ҰСЫНЫЛАТЫН НӘТИЖЕ МЕН ПЕРСПЕКТИВА

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ЕВРОПЕЙСКИЙ ОПЫТ ОБУЧЕНИЯ БУДУЩИХ УЧИТЕЛЕЙ ИНОСТРАННЫХ ЯЗЫКОВ: ИТОГИ И ПЕРСПЕКТИВЫ ДЛЯ УКРАИНЫ

Аннотация. Цель исследования заключается в анализе подготовки будущих учителей иностранных языков в странах Европы для обобщения европейского опыта, который можно рекомендовать в качестве перспектив для улучшения подготовки будущих учителей иностранных языков в высших учебных заведениях Украины. Исследование проведено с использованием методов анализа и обобщения теоретических основ для выяснения особенностей подготовки будущих учителей иностранных языков в европейских странах; метода сравнительного анализа для возможности сравнения организации, функционирования, развития системы обучения иностранных языков в европейских странах; метода прогнозирования для возможности выделить важные направления в качестве перспектив совершенствования подготовки будущих учителей иностранных языков в украинских высших учебных заведениях.

Основное внимание в этом исследовании уделяется анализу опыта подготовки будущих учителей иностранных языков в высших учебных заведениях таких стран, как Германия, Франция, Польша, Швейцария, Италия, Чехия, Венгрия, Финляндия и Эстония. Сравнительный анализ системы иноязычного образования в европейских странах позволил авторам статьи выявить общие и специфические особенности подготовки будущих учителей иностранных языков в европейских странах, а также выделить модели в структуре подготовки будущих учителей иностранных языков: бакалавр-педагог, бакалавр-лингвист, магистр, что свидетельствует о широкой вариативность и динамичности развития системы подготовки будущих учителей иностранных языков в странах Европы. В результате проведенного компаративного анализа сформулирован вывод, что содержание подготовки будущих учителей иностранных языков в вышеупомянутых странах Европы характеризуется сочетанием теоретического и практического блоков педагогической, языковой и методической направленности, а также вариативных дисциплин в составе этих блоков. Обобщение европейского опыта подготовки будущих учителей иностранных языков дал авторам статьи возможность выявить принципиально важные направления такой подготовки и сформулировать основные рекомендации в качестве перспектив для улучшения подготовки будущих учителей иностранных языков в украинских вузах на уровне образовательной политики Украины: возможность многоуровневого педагогического образования, получение нескольких дипломов о высшем педагогическом образовании, которые позволят администрации школы дифференцировать преподавательскую функцию будущего учителя, создавать естественный кадровый конкурс и отбирать наиболее квалифицированных специалистов; активизация практической составляющей подготовки будущего учителя (педагогическая практика), где будущий учитель иностранных языков демонстрирует знания и компетенции, в результате чего школа получает квалифицированного специалиста; повышение социального статуса педагогической профессии, проявляющейся в способности осуществлять карьерный рост за счет развития собственных профессиональных компетенций учителя, повышающих статус учителя и его заработную плату, наличия конкуренции в обучении; расширенные функции профессиональной деятельности будущего учителя.

Ключевые слова: подготовка, будущие учителя иностранных языков, страны Европы, иноязычное образование, высшие учебные заведения.

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GLOBALIZATION AS A PHENOMENON OF CROSS-CULTURAL AND IDEOLOGICAL BASIS FORMATION

Abstract. The current era of globalization is a complex and multifaceted phenomenon. One of its most important aspects is "the gradual formation of a common human humanitarian: cultural, ideological, moral and ethical basis, which brings together nations and peoples with different civilizations, histories, traditions and cultures." In today's globalization, in particular, in the formation of its humanitarian foundations must use the cultural heritage of all civilizations, which will enrich each nation and the world community, but each nation will always preserve its language, religion and national values, distinguishing between cultures. Imitating the culture of another nation, which must remain, means inevitably kneeling. However, in recent times there has been a dominance of only one dominant power in world civilization. In other words, globalization of "Americanization", which relies on the financial and economic power of transnational corporations, is gaining momentum. Such a trend does not have a one-sided effect in developing countries, as well as in Europe.

Despite the fact that today the concept of globalization is widely known, D.V. Ivanov points out: “The first signs of a crisis in the global paradigm of change are obvious. By simulating economic integration, the formation of a transnational bureaucracy, and the growth of multicommunities, the theory of globalization does not describe similar new trends that emerged in the late twentieth century: the influence of simulations, as well as computer revolution and cyber.

In general, the concept of globalization in sociology includes a wide range of events and trends: the development of world ideologies, the intensive struggle for world order; increasing the number and influence of international organizations, weakening the independence of nation-states; emergence and development of transnational corporations, growth of international trade; mass migration and creation of multi-communities; the creation of global media and the invasion of Western culture in all regions of the world, etc.

Despite extensive research by sociologists in the field of the theory of globalization, modern foreign researchers show that economic and political concepts are widespread. These studies are often supplemented by an analysis of cultural opportunities, which is associated with the role of the state, the economy and the technological revolution.

Many authors also point out that global competition has negative consequences, even in the Western labor market. For example, the German sociologist Erich Veda noted that the restriction of world free trade does not benefit not only Western countries, but also non-capitalist countries. First, poor countries that have lost Western markets are "forced to feel hatred of the West." Second, globalization allows the West to shift some of its workers to higher-paying jobs in order to meet external demand. Third, for Western consumers, globalization means lower prices for many imported goods” [1].

In some of the works of recent years [2], it is hoped that the increase in prosperity will have an indirect effect on democracy and a direct reduction in the threat of war and conflict.

Key words: globalization, intercultural, ideological, basis, formation, phenomenon.

Introduction. The current period of globalization is characterized by the West's desire to dominate culture, especially politically, so it can be conditionally called Westernization. At its core is the Americanization, because in today's political arena, the United States occupies a leading position in the world, declaring its hegemony and avant-garde. In this regard, a number of authors talk about the current era of globalization, first of all, about the Americanization of the world. Russian researchers V.A. Lisichkin and L.A. Shelepin will consider in detail the means by which it travels [3]. In their book,

they oppose US policy, arguing that they are largely implementing a long-term program aimed at "organizing global power".

V.A. Lisichkin and L.A. Shelepin understand globalization as "the creation of a centrally managed global economic system." They see the United States as the "global empire of evil." Full coverage of world power involves the implementation of a long-term program for the whole world. As a means to achieve this goal, they use four weapons: informational, military, environmental and financial. Therefore, in addition to the main directions of globalization policy, it is necessary to pay attention to the use of the religious factor in the implementation of modern globalization projects.

And their military means are, first and foremost, to intimidate the world through their powerful armed forces, to acquire nuclear weapons, and to demonstrate their opposition to nuclear-weapon states through violence and intimidation. This is done with the aim of "preserving peace in the world." "Should peace be maintained through war?" the question arises.

And the information impact is reflected on different scales. For example, many political scientists and politicians emphasize that the world is pursuing a policy of provocation through information. The so-called "American culture" multiculturalism is not just a model of multiculturalism, but is associated with the ideologicalization of its values in the world. These values are sometimes incompatible with human well-being.

The next issue is the structural composition of global processes. Considering the efforts made to implement global projects, we can note a variety of aspects: military, religious, ideological, philosophical, legal, moral, economic, etc. In some cases, only one aspect, in other cases two, three or more aspects prevail. If we analyze the previous attempts at globalization in terms of speed, durability and longevity, we must take into account all the factors and considerations that guided at that time, in particular, the decision-makers.

Fernand Brodel points out that in any globalization there are four main aspects that shape the order of relations: the economic aspect, the social aspect, the cultural aspect and the political aspect. According to him, these aspects do not affect them individually, they should not be considered individually, as they together form a system, none of which can be isolated. We need to learn from the experience of the past - the economic aspect can not be considered in isolation.

Fernand Broadel emphasizes that it is not just a mistake to take into account the economic factor, it is a dangerous mistake. "The economic history of the world," he writes, "is the history of the whole world, based on the prism of economics, viewed from a single point of view, in particular from an economic point of view." Choosing this approach means using a form of one-sided and dangerous interpretation from the outset.

According to the Russian scientist R.F. Matveev, "in the past, military, religious and ideological considerations clearly prevailed over legal and moral considerations. Economic factors were not important in the past, which was due to the underdevelopment of the economy "[4]. This is one of the reasons for the instability and short-term nature of real global processes in the past. Today, in some countries, the economy has risen alongside military and ideological factors, which have become the leading factors in globalization. However, notes RF Matveev, - there are contradictory trends. On the one hand, "there is a tendency to internationalize economic and trade relations, which is in the interests of large enterprises, as well as the interests of all mankind, the successful development of machinery and technology, the interests of consumers who make up the majority of mankind" [4]. On the one hand, there are constant attempts by some states to gain significant economic, financial, as well as political unilateral advantages at the expense of competition and even at the expense of a partner.

This situation is, in fact, probably due to the fear that some or all of the utopian nature of the minority will dominate the majority. For example, it is argued that "their heads are full of fantastic fears or apprehensions of the 'world government' type, a government that they think is or is likely to rule us" [5]. Here A.S. Alekseev believes that such power is deceptive.

Even in modern sociology, the social processes of globalization are widely and discussed from different perspectives. This is also due to the lack of a comprehensive theory of globalization. There are theoretical views on some aspects of this diverse phenomenon. However, although globalization is a single complex that requires its own consistent approach, each of these theories lives in isolation from the others.

There are different approaches to globalization. For example, Western scholars such as Wallerstein, Meyer, and Robertson have differing opinions. According to Wallerstein's theory of the world system, the world is divided into centers (mature nations) that look over the peripheral regions (developing countries) [6], – suggests a negative view of globalization.

Meyer refuted Wallerstein's main argument about the structure of the world system, which consists of economically prosperous countries and their dependent peripheral countries. According to Wallerstein, the world system is not only the world of economics, but also the world of the global system of nation-states. Meyer's main argument is that "world building" is a system that works alongside the world economy, but is not significantly functionally dependent on it.

Next, we will focus on the views that are neutral on the phenomenon of globalization. Some of them emphasize the fate of nation-states and their place in the context of globalization. And while some look at its history, others see globalization as a utopia and need to be ignored. And some saw it as just a historical process.

Nation-states are not only connected with the world economy, they also influence the process of the global system. It is a process of globalization, which means that it consists of different societies that interact with each other to create a world system divided by national interests.

Roland Robertson also pays special attention to national societies. According to him, in order to create a "single space", the whole world will become more interconnected, where national societies will one day disappear. Because, in our opinion, many nations and peoples have disappeared or been swallowed up by others, even though there is no process of globalization to date. The same is true of the nations and ethnic groups in Russia that are losing their language and mentality. But we must not forget about the imperial policy and the fact that the nation can not be unique.

One of the directions that gives rise to a neutral or rational approach to globalization is historical. That is, it does not look at globalization from a positive or negative point of view, but from the perspective of integration in history, explaining that globalization, which began in the late twentieth century, is the next cycle.

For example, let's look at some of the views on this channel. In fact, the debate on globalization emerged in the mid-1980s, developed and promoted by Roland Robertson [7]. According to him, globalization is a long historical process, the beginning and formation of the preconditions of globalization dates back to the XV-XVI centuries [8]. M. Waters has the same opinion [9]. However, T. Turborn has found at least six "waves" of globalization throughout history, the first of which is the expansion of world religions in the III-VII centuries [10].

Russian scientist DV Ivanov, who disagrees with this view, notes that "globalization in terms of intensity and prevalence at the macro-social and micro-social levels clearly contradicts the processes that preceded it." Therefore, such models developed by theorists of globalization are not suitable for the analysis of trends in the past. Defining these processes as globalization processes, in the opinion of D.V. Ivanov, "contradicts history, because the patchwork of non-existent features, such as intensity and inclusiveness, obscures the concept of globalization" [11].

In fact, if we follow Robertson, Waters, and even Therbon, if we attribute any international, intercultural relations, and geographical discoveries of Europeans from the fifteenth century, and even changes from the third century, to globalization, we will define it by the concept of "globalization." The identification of phenomena with different properties on different scales makes "globalization" an abstract instruction that repeats the movement of people and the results of their activities around the globe from specific scientific concepts that reveal the specifics of modern processes.

Considering the social and cultural progress in human society in the twentieth century, D.V. Ivanov divides the theoretical research of the classics and modern researchers into subject areas, giving the concepts of "internationalization" and "globalization", respectively. He called "internationalization" the growth of a system of economic and political relations at the level of national institutions (states, intergovernmental organizations, non-governmental, but national organizations), an idea that dates back to the XIX century and aroused interest in classical theory of development. However, in any case, this description is not enough to describe the current processes that are qualitatively different from internationalization.

In fact, internationalization depends only on the national, national, mental nature of globalization, where it is economic. political, cultural, etc. industries are left out.

Wallerstein emphasizes the differences between local societies - traditional types of empires and the capitalist world - the economy that emerged in the XV-XVI centuries [12]. Within the world of economics, there are social groups in the center of the system, in the peripheral region and in the semi-peripheral region. Groups are divided by the nature of the connections, not by geographical proximity. In the capitalist world, there are corporations and competition in the economy. There is also a relationship of exploitation and dependence between the center and the periphery.

One of the neutrals of globalization is that he does not pay much attention to the concept, and some people criticize it rationally, but they do not have a very negative emotional outlook.

Proponents of the paradigm of the world system reject the use of the term "globalization", believing that it is enough to present it simply as a conjuncture [13]. We can explain it as follows: it means giving a special name to the natural processes that take place in any society, turning them into special terms and bringing them to the field of study. They don't think it's necessary.

Wallerstein proposes to interpret the empirically determined social changes as the transition of the capitalist world system to a period of crisis, the beginning of which dates back to 1967-1973. Models of globalization developed on the basis of criticism of the theory of the world system and the theory of the global system are an alternative to the models of the global system. Back in 1968, Roland Robertson argued that culture was crucial in "systematizing" the world, and in the mid-1980s, Roland Robertson proposed the following thesis: "Wallerstein's model of national economy and the global interdependence of states is one of the aspects of globalization. The second aspect is that the individual consciousness of individuals has a special role in the transformation of the world into a "single social place" [14].

Defining globalization as a series of changes that are determined empirically, but by the logic of transforming the world into a "single place" has allowed Roland Robertson to formulate a much wider range of this process than global system theorists. In this case, the unity of place means that the conditions and nature of social interaction are the same anywhere in the world. Events in the far corners of the world can be the only conditions or elements of social interaction. Simply put, the world automatically "accumulates." If there are no significant barriers to accumulation, it will have an indivisible integrity to specific areas of social space [15].

Robertson identifies two directions of globalization: global institutionalization of the living world and localization of globalization [16]. The global institutionalization of the living world is interpreted as the organization of daily local interactions and socialization through the direct macrostructural influence of the world order.

The second direction of Robertson's model of globalization is the localization of globalization not from "above" but from "below", ie through the localization of interactions with other states and cultures, the introduction of elements of other national, "exotic" local cultures into everyday life. to display. In multicultural communities, the categories of "international relations", "clash of civilizations", "transnational corporations" are practical manifestations of interaction.

In this regard, we can explain the essence of his idea as follows: Globalization - "international relations", globalization - "clash of civilizations", globalization - "transnational corporation", that is, globalization is just a combination of these former concepts.

Robertson's model allows us to formulate globalization not only as structural changes, but also as changes in the mood of consciousness and interpersonal interactions. At the same time, Robertson's view of globalization is fraught with the possibility of the existence of an opposition that both exploits and denies globalization. According to Robertson, the term "global" means not only "international" and "transnational", but also "transcultural" and "transnational". The concept of global includes all social, global and local phenomena.

Robertson's approach to globalization was warmly received by many researchers in the 1990s. For example, theorists such as W. Beck and G. Turborn, who are known for their peculiarities in the study of modernization, have developed individual models of global society [17]. "What is globalization?" In his work, Beck introduced the category of transnational social space [18], which basically corresponds to Robertson's concept of "single place". According to Beck, globalization means "the daily activities of the economy, information, ecology, technology, transnational conflicts and various dimensions of civil society".

In Goran Terbourn's work "Globalization", the term "globalization" refers to the process of "worldwide spread of social phenomena, influence or awareness of the world about something among social factors" [19]. Thus, Terborn continued on the path taken by Robertson, combining global interdependence and global consciousness into a single model. Terborn proposes a model of global socialization that formulates change at two levels (macro and microsocial) and in two directions (individual globalization and localization of globalization). The theoretical models developed by Robertson, Beck, and Thorborne re-suggest the type of theory of globalization that is prevalent in sociology today. The spatial reference of the theory for this direction is the theory.

The third type of model of globalization was formed in the late 80s and early 90s of the XX century on the basis of a radically different understanding of the concept of "globalization" spatial referencing [20]. In 1990, Arjun Appadurai began to lay the foundations for this type of model with his article "Divisions and Differences in Global Culture and Economy" further developed in the book [21]. He sees globalization as deregulation - the elimination of the dependence of social processes on physical space [22].

In the process of globalization, a "global cultural flow" is formed, which is divided into five cultural-symbolic space-flows (landscapes): ethno-space (ethnoscapes) - with the flow of tourists, immigrants, refugees, migrant workers; financial space (finansscapes) - with capital inflows; mediascapes - with a stream of images; ideological space (ideoscapes) - is formed by the flow of ideology.

Malcolm Waters' work "Globalization" contains the logic of replacing the local / global dichotomy with the territorial / non-territorial dichotomy [9]. Globalization is interpreted as a set of processes associated with the dominance of symbolic exchanges, leading to the deregulation of social events. According to Waters, the foundation of the theory of globalization is the concept of the relationship between social organization and territory.

Waters analyzes globalization in the field of culture based on the concept of Appadurai. The "dimensions" of culture in Waters' theory are as follows: sacriscapes - defined by a simulated stream of religiosity; ethnoscapes - observed through simulations of ethnic similarity; economic space (econoscapes) - is reflected in the flow of value and capital simulators; mediascapes - information is represented by a stream of simulators; leisurescapes - entertainment and impressions, for example, are created by tourist simulators [9].

Summing up the analysis of theoretical models of globalization, Ivan Ivanov proposed three types - the global system (Giddens, Sclera), global socialization (Robertson, Beck, Terborn), social deregulation (Appaduri, Waters). We see that the "formulation" generates three "waves" or "directions". Through this paradigm, he argues that "any empirically determined process of change is interpreted as an aspect, part, or a form of globalization." For example, Robertson, Appaduri and Terborn introduced into the concept of globalization the growth of separatism, cultural and religious fundamentalism, social movements against globalization, Waters - consumerism, Beck - the escalation of environmental problems. However, the expansion of the theory of globalization was achieved by eliminating the paradigmatic differences in the concept of "local / global".

There are also debates among experts about the main reasons for concern about globalization, such as "whether it is global free trade or the development of technology." In recent years, the reputation of those who believe that the development of technology is a more important factor than globalization is gaining ground [23].

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ЖАҺАНДАНУ ИДЕОЛОГИЯЛЫҚ ЖӘНЕ МӘДЕНИЕТ АРАЛЫҚ НЕГІЗ ҚАЛЫПТАСТЫРУ ФЕНОМЕНЫ РЕТІНДЕ

Аннотация. Қазіргі жаһандану кезеңі – күрделі әрі көпқырлы құбылыс. Оның маңызды аспектілерінің бірі – «әлдебір жалпы адами гуманитарлық: мәдениетанымдық, идеологиялық, моральдық-этикалық негіздерді біртіндеп қалыптастыру, осы арқылы түрлі өркениетке әрі түрлі тарихқа, дәстүр мен мәдениетке ие ұлттар мен халықтарды жақындата түседі». Қазіргі жаһандану барысында, атап айтқанда, оның гуманитарлық негіздерін қалыптастыруда адамзаттың барлық өркениеттік ағындарының мәдени мұрасын пайдалануы керек, мұның өзі әр халықты және әлемдік қауымдастықты байыта түсері анық, дегенмен, әрбір ұлт өз мәдениетінің аражігін ажырата отырып, тілін, дінін, ұлттық құндылықтарын мәңгі сақтап қалуы қажет өзге ұлттың мәдениетіне еліктеу – еріксіз тізе бүгу деген сөз. Алайда соңғы уақытта әлемдік өркениетте бір ғана үстем державаның басымдық танытуы байқалуда. Басқаша айтқанда, трансұлттық корпорациялардың қаржы-экономикалық қуатына арқа сүйейтін «американдыру» жаһануы белең алып келеді. Мұндай үрдіс дамушы елдерде, сонымен қатар Еуропада да біржақты жақсы әсер тудырмайды.

Қазіргі таңда жаһандану концепциясының кеңінен танымал болуына қарамастан, Д.В. Иванов былай деп көрсетеді: «Өзгерістердің жаһандық парадигмасының дағдарысқа ұшырауының алғашқы белгілері көзге ұрынып тұр. Экономикалық ықпалдасу, трансұлттық бюрократияның қалыптасуы, мультиқауымдастықтардың өсу үрдістерін ұқсата үлгілей отырып, жаһандану теориясы XX ғасырдың соңына қарай

туындаған ұқсас жаңа үрдістерді, атап айтқанда, экономикадағы, саясаттағы, мәдениеттегі шынайы заттардың әрекеттердің орнын ауыстыратын образдардың – симуляциялардың әсер етуі, сонымен қатар, компьютерлік революция және кибермәдениеттің қалыптасуын суреттемейді.

Жалпы алғанда, әлеуметтанудағы жаһандану ұғымы оқиғалар мен үрдістердің кең ауқымын қамтиды: әлемдік идеологиялардың дамуы, әлемдік тәртіп орнату үшін қарқынды күрес жүргізу; халықаралық ұйымдардың саны мен әсерінің ұлғаюы, ұлттық мемлекеттер тәуелсіздігінің әлсіреуі; трансұлттық корпорациялардың пайда болуы мен дамуы, халықаралық сауданың өсуі; жаппай қарқынды көші-қон мен мультимәдениеттік қауымдастықтардың құрылуы; ғаламдық БАҚ құрылуы мен әлемнің барлық аймақтарына батыс мәдениетінің өктемдігі және т.б.

Әлеуметтанушылар тарапынан жаһандану теориясы саласында жүргізілген қомақты зерттеулерге қарамастан, қазіргі заманғы шетелдік зерттеушілер негізінен экономикалық және саяси тұжырымдамалардың таралғандығын көрсетіп отыр. Бұл зерттеулер, көп жағдайда, мәдени мүмкіншіліктерге жасалған талдау арқылы толығып келеді, мұның өзі мемлекеттің, экономиканың және техникалық революцияның рөліне байланысты болып келеді.

Сонымен қатар көптеген авторлар тарапынан жаһандық бәсекелестік, тіпті батыс елдерінің еңбек нарығында да теріс салдарға әкеліп отыр деген дерек келтірілді. Мәселен, неміс әлеуметтанушысы Эрих Веденің пікірінше, әлемдік еркін сауданы шектеу батыс елдерімен қоса, капиталистік емес әлем елдерінің де пайдасына аспайды. Біріншіден, батыс мемлекеттерінің нарығынан айырылған кедей елдер «Батысқа деген жек көру сезімін бастан кешуге мәжбүр». Екіншіден, жаһандану «Батыста жұмысшылардың бір бөлігін сырттан сұраныс болуы үшін жоғары жалақы төленетін жұмысқа ауыстыруға мүмкіндік береді. Үшіншіден, батыс тұтынушылары үшін жаһандану көптеген импорт тауар бағаларының төмендеуін білдіреді» [1].

Соңғы жылдардағы жұмыстардың кейбіреулерінде [2] әл-ауқаттың артуы демократияға жанама түрде әсер етіп, соғыс пен қақтығыстар қаупін тікелей сейілтуге ықпалын тигізеді деген үміт бар.

Түйін сөздер: жаһандану, мәдениаралық, идеологиялық, негіз, қалыптастыру, құбылыс.

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ГЛОБАЛИЗАЦИЯ КАК ФЕНОМЕН ФОРМИРОВАНИЯ МЕЖКУЛЬТУРНОЙ И ИДЕОЛОГИЧЕСКОЙ ОСНОВ

Аннотация. Нынешняя эпоха глобализации является сложным и многогранным явлением. Одним из наиболее важных аспектов является «постепенное формирование общей гуманитарной: культурной, идеологической, моральной и этической основ, которая объединяет нации и народы с разными цивилизациями, историями, традициями и культурами». В условиях современной глобализации, в частности, при формировании своих гуманитарных основ необходимо использовать культурное наследие всех цивилизаций, которое обогатит каждую нацию и мировое сообщество, но каждая нация всегда будет сохранять свой язык, религию и национальные ценности, различая культуры. Подражать культуре другой нации, которая должна остаться, означает неизбежно становиться на колени. Однако в последнее время в мировой цивилизации доминирует только одна сила. Другими словами, глобализация «американизации», которая опирается на финансовую и экономическую мощь транснациональных корпораций, набирает обороты. Такая тенденция не имеет одностороннего эффекта в развивающихся странах, а также в Европе.

Несмотря на то, что сегодня концепция глобализации широко известна, Д.В. Иванов отмечает: «Первые признаки кризиса в глобальной парадигме перемен очевидны. Моделируя экономическую интеграцию, формирование транснациональной бюрократии и рост многообщинных сообществ, теория глобализации не описывает аналогичные новые тенденции, появившиеся в конце двадцатого века: влияние симуляций, а также компьютерная революция и кибернетические процессы».

В целом понятие глобализации в социологии включает в себя широкий спектр событий и направлений: развитие мировых идеологий, интенсивная борьба за мировой порядок; увеличение числа и влияния международных организаций, ослабление независимости национальных государств; возникновение и развитие транснациональных корпораций, рост международной торговли; массовая миграция и создание мультиобществ; создание глобальных СМИ и вторжение западной культуры во все регионы мира и т. д.

Несмотря на обширные исследования социологов в области теории глобализации, современные зарубежные исследователи показывают, что экономические и политические концепции широко распространены. Эти исследования часто дополняются анализом культурных возможностей, что связано с ролью государства, экономики и технологической революции.

Многие авторы также отмечают, что глобальная конкуренция имеет негативные последствия даже на западном рынке труда. Например, немецкий социолог Эрих Веда отметил, что ограничение мировой свободной торговли выгодно не только западным, но и некапиталистическим странам. Во-первых, бедные страны, потерявшие западные рынки, «вынуждены чувствовать ненависть к Западу». Во-вторых, глобализация позволяет Западу переводить некоторых своих работников на более высокооплачиваемые рабочие места для удовлетворения внешнего спроса. В-третьих, для западных потребителей глобализация означает снижение цен на многие импортируемые товары» [1].

Можно надеяться, что в некоторых работах последних лет [2] увеличение благосостояния окажет косвенное влияние на демократию и приведет к прямому снижению угрозы войны и конфликта.

Ключевые слова: глобализация, межкультурный, идеологический, базис, формирование, феномен.

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LEGAL, ORGANIZATIONAL AND ECONOMIC ASPECTS OF PHYSICAL REHABILITATION AND REINTEGRATION OF COMBAT VETERANS

Abstract. The article analyzes the best practices of foreign experience of rehabilitation services for war veterans. The modern institutional structure, legal and organizational aspects of the rehabilitation and reintegration of war veterans are characterized. The essence, importance and necessity of physical rehabilitation, the creation of a single rehabilitation space, the introduction of an interactive map for the provision of social rehabilitation services in accordance with uniform standards, as well as systems for monitoring their effectiveness and quality at the state level, are substantiated. It is concluded that the success of rehabilitation and re-adaptation programs for war veterans depend on the timely adoption of necessary legal acts, proper financing, and rational use of budget funds. It is emphasized the importance to strengthen the economic mechanism for the rehabilitation and reintegration of war veterans on the basis of principles - targeting, diversification, adaptation to the socio-economic profile of each war veteran and the domestic economic situation in the country, maximally activating new forms of cooperation and partnerships between government bodies, non-governmental organizations and business. It is concluded that national systems of rehabilitation and reintegration of war veterans require a paradigm shift in accordance with modern international approaches, standards and practices.

Key words: law, public policy in the field of social protection, physical rehabilitation of combat veterans, reintegration of combat veterans, social protection of combat veterans, economic mechanism.

Introduction. The problems of rehabilitation and reintegration of combat veterans are very important today, especially in the countries, involved into armed conflicts. There are dozens of ongoing armed conflicts in the modern world, including the Afghanistan–Pakistan skirmishes, Al-Qaeda insurgency in Yemen, Moro conflict, International military intervention against ISIL, War in Afghanistan (2001–present), Insurgency in Ogaden, Bangladesh Drug War, Philippine Drug War, Kamwina Nsapu rebellion, Saudi Arabian-led intervention in Yemen, Yemeni Civil War (2015–present), Somali Civil War, War in Darfur, ECOWAS military intervention in the Gambia, Islamist insurgency in Mozambique, Kashmir conflict, Insurgency in Balochistan, Insurgency in Khyber Pakhtunkhwa, Conflict in the Niger Delta, Cabinda War, Boko Haram insurgency, Insurgency in the Maghreb (2002–present), South Thailand insurgency, Sinai insurgency, Saudi Arabian–Yemeni border conflict (2015–present), Rohingya genocide, Boko Haram insurgency, Kurdish–Turkish conflict (1978–present), Mexican Drug War, War in Donbass, Syrian civil war, etc. [1; 2]. A significant number of traumatized combat veterans require the creation of a comprehensive system of effective physical rehabilitation. The primary task is to develop a system of rehabilitation and reintegration of combat veterans, based on the consolidation of efforts and comprehensive support of the state and society, adapted to the national historical, political, economic, legal and socio-cultural contexts, focused on the implementation of a better foreign experience.

Methods of research. The problems of rehabilitation and readaptation become especially acute after the wars and military conflicts, which were extremely frequent in the XX and in the early XXI century. This necessitates a certain actions and comprehensive scientific researches, because the impact becomes

noticeable only after the expiration of a certain time period, so a sound legal basis and substantial funding are necessary to eliminate the harmful consequences. The problems of the legal protection of the participants of the military conflicts were investigated by K. Gajdej, J. Grygorenko [3], D. Chyzhov [4], the problems of the budgetary policy, formation of financial resources, economic mechanisms of reintegration, social protection – by I. Storonianska [5], I. Chekanova [6], J. B. Perlin [7], G. Hoff [8], etc., the problems of rehabilitation and readaptation – by Landes S. D., etc. [9], J. Bryndikov [10], the foreign experience of combat veterans rehabilitation was investigated by A.A. Denisov [11], G.F. Solomon [12], D. J. Knapp, T. R. Tremble [13], N.N. Alalykina [14], A.M. Burlak [15], Ye. Smirnov [16], A.A. Bove, S.J. Oxler [18], A.G. Karayani [19], A.I. Vorobiyov [20], V.S. Novikov [21], T. Grining [22] and others. The wellknown Kazakh authors A.T. Karimova, M.N. Sarkulov, M.N. Yesengulova, A.V. Gavrina investigated the general psychological aspects of medical health care [23], as well as T.A. Apendiyev and N.M. Abdukadyrov researched the problems of the treatment of the prisoners of war, captured during the First World War [24], etc.

The purpose of the study is to analyze, generalize and conceptualize the foreign experience in the formation of the legal framework, institutional infrastructure, economic mechanisms for ensuring physical rehabilitation and reintegration of combat veterans.

Research results.

1. International practice of combat veterans rehabilitation. It is necessary to say, that the scientific definition of the term "rehabilitation" changes under the influence of the historical context. In particular, the development of the different types of rehabilitation started during the First World War. Thousands of injured soldiers received the rehabilitation and remedial treatment.

The significant contribution in the research of the military personnel rehabilitation was made by A. Denisov [11] and G.F. Solomon [12]. These scientists created the conception, based on such principles as: approaching of the rehabilitation measures to the scene of the fighting; timeliness and completeness of assistance; the support of the confidence of the wounded soldiers, that they will return to normal life after the treatment. This Conception was realized during the Korean War, the Vietnam War and all other next wars [13, p.207-209].

We think, that it is very interesting and important to analyze the foreign experience of rehabilitation. The Commission of experts of the World Health Organization (WHO) made the first session on rehabilitation in 1958. The main scientific principles of rehabilitation as well as the directions of the next researches in this sphere were defined during the session [11]. At the same year the International system of organization of rehabilitation was created. The International society on the rehabilitation of disabled people was established in 1960, it joined to the WHO and cooperates with UN and UNESCO [14].

Famous foreign researchers of rehabilitation created the conception of isometric, which became the ground of creation of the informational exercise machine system. The first system appeared in the trauma center in 1968. It was the passive isokinetic exercise machine, which was used to test the damaged functions and to make the rehabilitation. Isokinetic equipment has been used since the 1980-th in American trauma centers for the rehabilitation [15].

It is necessary to say, that the social rehabilitation experience of the US Armed Forces is the most progressive. The creation of the social rehabilitation service on the scene of fighting gives the opportunity to reduce the number of combat veterans, who suffer from the mental health disorders. It helps to solve the problem of the social rehabilitation [11].

During the Second World War in the American army the hospitals for convalescent patients were the part of the system of the military health facilities. Wounded and ill people in the departments for the convalescent patients received the complex therapy in the connection with the physical training. At the same time, all wounded and ill people were confined to barracks [16].

The Combat Stress Center of the US Army, organized during the Persian Gulf War, is a perfect example of such health facility. Its personnel included 38 people, who during 6 months provided 514 patients with the health check and medical care. 650 thousand of American soldiers and officers participated in the Persian Gulf War. It was planned, that in the case of escalation of conflict and increase of the number of injured people, the personnel of the Center will be increased by the experienced psychiatrists from the rear area. For example, the emergency psychiatric care was necessary for the personnel of the 71st air rescue squadron of the US Air Force, which lost 5 people as killed and 19 people as wounded as the result of the bomb explosion in the Saudi Arabia [17, p.391-395]. During the next

2 days after the explosion, approximately 100 people of the personnel of the psychiatric clinic of the Patrick Air Force Base, Florida, were sent to the Saudi Arabia and provided with the medical care 100 injured people. The majority of people, who need care, appear during the first month of the combat operation [18].

In the American army, the system of measures of prevention of battle fatigue and their consequences defined in the special Field Manual FM 26-2 "Management of Stress in Army Operations", they are: effective and stable troop command and control; high level of the battle training; physical cold training of the personnel; good state of health; ability of soldiers and officers to relax in hard battle conditions and to perform autogenic training [19, p.62-67].

Modern American army has 160 thousand of psychologist and rehabilitation therapists, who are distributed to military units, including frontline. Each of them takes care of 12-16 soldiers and members of operating personnel. Psychologist and rehabilitation therapists provide people with consultative and primary educational psychological care. There are different recommendations to the military command on the adaptation and rehabilitation of the military personnel on the different stages of the military service [20, p.13-18]. Troops, who were pullout, need social and psychological support, and soldiers, who returned home, need a hearty welcome, including enthusiasm, forgiveness, care [21, p.88-102].

The international cooperation of the Commonwealth of Independent States in the sphere of combat veterans' rehabilitation also has the positive experience. These countries have the common history of the participation in the Second World War, in the Soviet-Afghan War and in the UN peacekeeping missions.

The decision of the Warriors-Internationalists Affairs Committee under the authority of the Council of the Heads of Governments of the Commonwealth of Independent States on the realization of the Conception of the development of the social and medical base of improvement of the quality of life and prophylaxis of the loss of the ability to work of the combat veterans, participants of the local conflicts, peacekeeping operations and victims of terrorism in the states-members of the Commonwealth of Independent States on 2006-2010 opens the new horizon of cooperation in the sphere of combat veterans' rehabilitation [22].

2. Legal basis of support and rehabilitation of combat veterans. The current legislation has the aim to guarantee the legal protection and effective physical rehabilitation of the combat veterans [25,26]. It determines the basic principles of creating of legal, socio-economic, organizational conditions to eliminate or compensate for the consequences, caused by persistent health disorders, to support physical, mental, social well-being of the disabled people and to assist them in the achieving of a social and material independence. Also, the State target program for the period up to 2023 was adopted to increase the effectiveness of physical rehabilitation and psychosocial readaptation of combat veterans.

At the same time, imperfection and untimely adoption of important acts of legislation has serious consequences and impacts on the realization of rehabilitation and readaptation measures of combat veterans. The analysis of the state of normative legal support of social and professional adaptation of combat veterans confirms this. For example, the presence of significant bureaucratic obstacles is evidenced by the red tape regarding the draft Regulation of the Cabinet of Ministers of Ukraine "On a certain aspects of organization of social and professional adaptation of the combat veterans", which was developed in 2015-2017, and after that it was in a permanent state of refinement under the Ministry of Social Policy approval procedure. The same situation took place with the adoption of the Regulation of the Cabinet of Ministers of Ukraine No. 1057 "On the approval of the Procedure of psychological rehabilitation of the combat veterans". In December 2018 the ineffective activity caused the need to create and adopt the Regulation of the Cabinet of Ministers of Ukraine No. 1175 on approval of the Regulation "On the Ministry of Veterans", which was empowered to form and realize the state policy in the field of social protection, provision of psychological rehabilitation, social and professional adaptation, employment, etc. of combat veterans, as well as the members of their families.

3. Institutional infrastructure and organizational aspects of providing of physical rehabilitation of combat veterans. It is necessary to note, that the states of the post-soviet territory have inherited the Soviet rehabilitation system, which has not yet undergone any fundamental changes during the last 30 years, except, perhaps, an increase in financing for sanatorium treatment and the provision of technical means of rehabilitation.

As usual, only some combat veterans underwent comprehensive rehabilitation after the participation in the military conflict. At the same time, experts say, that psychological adaptation is necessary for the majority of the combat veterans, because in the case of insufficient treatment the posttraumatic stress

disorder returns in future and becomes sharper. It should be noted, that the post-traumatic and postoperative sequelae are accompanied by changes in the functioning of many organs and systems, which causes numerous pathophysiological reactions.

Physical rehabilitation contributes to the maximum recovery of functional changes of the body. An important role in the remedial treatment by the means of physical rehabilitation belongs to the remedial gymnastics. Exercises help to restore motor activity, improve the functions of the cardiovascular system, restore the full respiratory mechanism, activate the secretory and motor functions of the digestive tract, improve kidney function, accelerate metabolic processes, etc. But it is necessary to say, that the positive impact of exercise take place only in a case of their systematic, purposeful and prolonged usage.

In particular, the necessity of continuous improvement of the mechanism of physical rehabilitation, creation of an effective institutional infrastructure and a generally national system of social protection, rehabilitation and readaptation of combat veterans is obvious. Today, the institutional infrastructure of the rehabilitation and readaptation of combat veterans includes a system of health care institutions, subordinated to the Ministry of Healthcare of Ukraine, as well as specialized medical institutions of the Ministry of Defense of Ukraine with the active participation of public, charitable, religious organizations and volunteers, medical and prophylactic facilities, medical-social centers and hospitals of war veterans work in all regions of the country [27].

Regarding the organizational aspects of the rehabilitation and readaptation of combat veterans, it is necessary to say, that active military personnel are permanently under the supervision of the command and, if necessary, receive rehabilitation assistance from psychologists, medical workers directly in military units and hospitals. They receive additional leaves and periodically go to departmental sanatoriums. Reserve officers and reserve soldiers are registered in social protection departments and receive the medical care like all citizens of Ukraine in accordance with general practice. If a veteran needs to receive a medical care or rehabilitation, he has to visit a family doctor, to go to an ambulatory-care clinic according to the place of residence, to stay in line. So, we see an absence of realization of accessible and complex habilitation and rehabilitation services, as well as absence of programs of personalized support for this category of citizens and their families.

The analysis of foreign experience of organization of the institutional structure of rehabilitation of combatants shows the effectiveness of the organization of specialized rehabilitation centers, in particular, centers for overcoming the consequences of psychological trauma (USA, Croatia). The cooperation of the government and the associations of public professional organizations is very useful, because it leads to the creation of a national system of distress tolerance centers, providing psychotherapy and psychological rehabilitation services for the population (Israel).

So, we think, that it is necessary to create a unitary rehabilitation space on the basis of the model of continuous support of combat veterans, to introduce an interactive map of providing social and rehabilitation services by uniform standards, as well as the systems of monitoring of their efficiency and quality at the state level. It is necessary to expand the institutional infrastructure of social and rehabilitation services with the help of creation of mini-centers in cities and territorial communities. These centers will ensure effective coordination of social and rehabilitation services, support of veterans and their physical rehabilitation on a permanent basis.

4. Economic aspects of ensuring of rehabilitation and reintegration of combat veterans. Strengthening of the economic mechanisms of reintegration of combat veterans is a very important matter, as well as the development and improvement of legal and institutional instruments and measures.

During the development and realization of the economic mechanisms of combat veterans' reintegration, it is necessary to remember, that the majority of combat veterans are economically vulnerable, because: 1) they lost available assets and ability to accumulate new assets, which limits their ability to carry out high-yield economic activity with the obligatory condition of attracting of a large amount of capital; 2) as usual they have lower level of education and professional competence; 3) they were traumatized and need the physical rehabilitation; 4) they have knowledges and skills of the weapon usage, so they may belong to the group of high risk for safety. The disabled combat veterans are a special group, because they need not only a physical rehabilitation, but also the special preparation for the employment, preferential access to capital in the case of the individual entrepreneurial activity, participation in programs of reintegration personally and with the members of their families.

So, the mechanisms of the economical reintegration should be based on the principles of targeting, diversification, adaptability to the socio-economic profile of each combatant and internal economic environment of the country. At the same time, they must be strictly limited in time to prevent the onset of dependency syndrome, the economic behavior of the dependent and to provide other categories of people with the necessary support.

The reintegration of combat veterans includes economic mechanisms in monetized and non-monatized forms, such as: land ownership, financing of needs, housing, vocational education, etc.

The possibility to receive the property right to land makes the lasting social and economic effect of reintegration in the sphere of the individual employment.

For example, the legislation of Ukraine declares the free transfer of land plots to citizens, including the combat veterans and other categories of people. The citizens of Ukraine have the right to free transfer of land from the land state or municipal property in these sizes: a) to conduct farming – in the amount of land (share), determined for farms located in the village, town or city council, where the farm. If the territory of village and city council are several farms, the amount of land (share) is defined as the average of these enterprises. In the absence of agricultural enterprises in the size of the relevant council land (share) is defined as the average for the region; b) to conduct personal farm – no more than 2.0 hectares; c) for the conduct of gardening – no more than 0.12 hectares; d) for the construction and maintenance of residential homes, commercial buildings and structures (croft) in the villages – no more than 0.25 hectares, in villages – no more than 0.15 hectares in urban areas – no more than 0.10 hectares; e) for an individual country construction – no more than 0.10 hectares; f) for the construction of individual garages – no more than 0.01 hectares [28]. So, more that 12000 hectares were transferred to combat veterans.

The rehabilitation and reintegration of combat veterans need the essential financial resources, which may be non-official (alternative) and official (such as: budgetary funds, grants and loans from international financial institutions with low or zero interest, bank loans).

In particular, the structure of the budget expenses of Ukraine in 2018 shows, that: 97.024 billion UAH (9.8% of the budget) were spent for the defense (and only 59.351 billion UAH, or 8.7%, – in 2016); 22.618 billion UAH (2,3%) – for the healthcare (and only 12.465 billion UAH, or 1.8% – in 2016); 163.866 billion UAH (16.6%) – for the social protection (and only 151.962 billion UAH (22.2%) – in 2016). At the same time, the expenses for the public order, safety and judicial power increases from 10.5% to 11.9%. During the period of 2017-2020, in the structure of financing of the activities of strengthening of the national defense of Ukraine, we see an increase of the expenses for the creating of a unified logistics system and reforming of the medical system of the Armed Forces according to NATO standards. The total expenditure for these needs is equal to 31.796 billion UAH. 10.233 billion UAH will be spending in 2020, and only 2.899 billion UAH were spent in 2017. However, despite the positive dynamics of financing, budgetary policies regarding the usage of expenditures on sanatorium-resort treatment, rehabilitation, social and professional adaptation cannot be considered effective [29, p.171-173]. According of the State Budget of Ukraine, 2.473 billion UAH (2.6%) were spent for the medical care, rehabilitation and sanatorium treatment in 2018, and 1.994 billion UAH (3.4%) – in 2016. At the same time, the Accounting Chamber of Ukraine made the audit and came to the conclusion, that the allocated funds for the social support of combat veterans in 2016-2017 were used partially. In particular, the State Budget on 2016 allocated 100.8 million UAH for psychological rehabilitation, sanatorium-resort care, social and professional adaptation, but only 86.7 million UAH (86.1%) were spent for these needs, and the rest of money were returned back to the budget. 107.6 million UAH were allocated in 2017, and only 28.4% were used, herewith 22.7% (11.5 million UAH) – for the sanatorium-resort treatment, and 40.9% – for social and professional adaptation. At the same time, the sum of money for sanatorium-resort care was increased from 22.5 to 50.5 million UAH, and the organs of social protection concluded tripartite agreements for 28.1 million UAH. The level of psychological rehabilitation this year was 0.1% of the total number of persons included in the Unified Register. It was provided only in Kyiv and Zhytomyr regions. It happened as the result of decrease of the budget financing from 50 to 21.9 million UAH (and only 2.3 million UAH of them were used). Such reduction is related to the "long-term formation of the normative base of the Ministry of Social Policy on issues of social support for combat veterans, organizational miscalculations of the Combat Veterans Service and social protection organs in the procurement of services, ineffective management decisions of these bodies at all stages of realization of measures" [29, p.171-173]. Unfortunately, the situation has not fundamentally changed.

The access to the bank loan depends on the solvency of the borrower. It is necessary to mention, that Ukrainian banks feel the social responsibility and develop the innovative programs of social lending for the combat veterans and people, who suffered from the conflict on the east of the country. For example, the State Savings Bank of Ukraine (or Oschadbank) according to "The Social Entrepreneurship Program" gives such loans for 5-10 per cent per annum, at the same time other programs give the loans for 9-20 per cent per annum.

Different forms of international financial support were implemented. The World Bank gave almost $ 17 million to the government of Rwanda in 2009-2014 for demobilization, support of social and economic reintegration of combat veterans, including women, children and disabled people. Also, it supported the Central African Republic government program and granted $ 30 million for the social and economic reintegration of 5 thousand of combat veterans in 2017-2020 for the rebuilding of the country after years of conflicts. The World Bank started the development of the reintegration model of Donbass in 2019, and the International Partnership Support Fund was established for this purpose, thanks to the common efforts with Ukraine.

There are such alternative sources, as different funds, P2P lending, crowdfunding from the non-governmental organizations, entrepreneurs and natural persons, which are popular in the modern world for the solving of the financial problems of combat veterans (the support of the entrepreneurial projects, payment for the medical, transport and public utility services, purchase or rental of housing, support of mobility, compensation for long-term care, etc.).

The economic mechanism of the acquisition of professional competencies, which give the opportunity to enhance the profitability of economic activity and social status of combat veterans, is very important for the successful reintegration. The US legislation approved a program to cover the various costs of education (up to 36 months of study), licensing and certification, national testing. The Ukrainian state guarantee the support for the combat veterans and their children in the sphere of the receiving vocational and higher education (free provision of textbooks, internet access, dormitory, payment of social scholarships, full or partial tuition fees, long-term educational credits). At the same time, the absence of motivation for the receiving of the education is a serious problem, because the educational process is long, education doesn't guarantee privileges, the levels of employment and creation of a new workplaces are low.

It is necessary to inform and consultate the combat veterans about the economic possibilities, provided by the economic mechanisms of the reintegration. We support the ideas of the Kazakh scientists, that the countries, which have the same levels of incomes, education and healthcare costs, may have different opportunities in the sphere of the solving of the most sharp problems of the health protection. So, the creation of the national health care system must be based on the evaluation of the possibilities to solve the most important tasks under the certain economic, social and political conditions, according to the achievements of the international experience [23].

The study of the Kazakh authors "During the First World War Germany and Austria – Hungary prisoners of the Aulieata county" describes the problems of the fate of the prisoners of war [24], and it is very interesting in the context of the future scientific researches. It is necessary to add, that the problem of the rehabilitation of the prisoners of war is very important, especially for the countries, involved into the local armed conflicts. Also, the unresolved problems of medical rehabilitation indicate the imperfection of international law in this area.

Conclusion. The physical and other types of rehabilitation are based on the natural innate qualities of a person, such as physical activity, which becomes a major stimulant and therapeutic agent, revealing potential opportunities to restore physical working ability and, as a consequence, to improve psychological health and quality of life. At the same time, the success of the implementation of the programs of rehabilitation and readaptation of combat veterans depends on the perfection, timeliness of adoption of important legal acts, proper financing and rational use of budgetary allocations, effective management on the principles of public-private partnership, cooperation of state organs and non-governmental organizations. National systems of rehabilitation of combat veterans require a change of paradigm in accordance with the modern international approaches, standards and practices. The priority task of the state policy is to develop and to adopt the program of medical and psychological rehabilitation of combat veterans, which must be based on the fundamental economic calculations. The establishments, which have the experience of such activity, must consolidate their efforts with the aim to create the program of the

medical, social and psychological rehabilitation, based on the complex scientific research. Also, it is necessary to add, that the effectiveness of the economic mechanisms of reintegration enhances the quality of life of combat veterans.

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СОҒЫС АРДАГЕРЛЕРІН ФИЗИКАЛЫҚ САУЫҚТЫРУ ЖӘНЕ РЕИНТЕГРАЦИЯЛАУДЫҢ ҚҰҚЫҚТЫҚ, ҰЙЫМДАСТЫРУШЫЛЫҚ ЖӘНЕ ЭКОНОМИКАЛЫҚ АСПЕКТІЛЕРІ

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ПРАВОВЫЕ, ОРГАНИЗАЦИОННЫЕ И ЭКОНОМИЧЕСКИЕ АСПЕКТЫ ФИЗИЧЕСКОЙ РЕАБИЛИТАЦИИ И РЕИНТЕГРАЦИИ ВЕТЕРАНОВ БОЕВЫХ ДЕЙСТВИЙ

Аннотация. Статья посвящена анализу правовых, организационных, экономических аспектов физической реабилитации ветеранов боевых действий. Охарактеризованы состояние и проблемы действующего законодательства Украины и ряда других стран. Доказано, что, несмотря на определенные достижения, до сих пор не существует эффективной комплексной системы социальной защиты, реабилитации и реадаптации ветеранов боевых действий.

Проведен анализ лучших практик зарубежного опыта реабилитационных служб для ветеранов боевых действий. Основное внимание уделено постсоветским государствам, европейским странам и США. Определено, что американская система реабилитации боевых ветеранов является наиболее эффективной, поскольку в ее основе лежит непрерывность реабилитационной деятельности.

Охарактеризована современная институциональная структура и организационные аспекты реабилитации и реинтеграции ветеранов войны. Обоснованы сущность, важность и необходимость физической реабилитации, создания единого реабилитационного пространства на основе модели постоянной поддержки ветеранов войны, внедрения интерактивной карты для предоставления услуг социальной реабилитации в соответствии с едиными стандартами, а также систем мониторинга их эффективности и качества на государственном уровне. Предлагается расширить институциональную инфраструктуру путем создания мини-центров в городах и территориальных общинах, что обеспечит эффективную координацию социальных и реабилитационных служб, поддержку ветеранов и их физическую реабилитацию на постоянной основе. Подчеркивается, что наряду с разработкой и совершенствованием правовых и институциональных инструментов и мер важно укреплять экономический механизм реабилитации и реинтеграции ветеранов войны. Сделан вывод о том, что успех программ реабилитации и реинтеграции ветеранов зависит от разработки и своевременного принятия необходимых правовых актов, надлежащего финансирования, рационального использования бюджетных средств, а также эффективного управления на условиях партнерства и сотрудничества государственных органов, неправительственных организаций и бизнеса. Доказано, что реинтеграция ветеранов боевых действий включает экономические механизмы (владение землей, финансирование потребностей, жилье, профессиональное образование) в монетизированной или немонетизированной формах на основе принципов адресности, диверсификации, адаптации к социально-экономическому профилю каждого комбатанта и внутренней экономической ситуации в стране. Сделан вывод о том, что национальные системы реабилитации и реинтеграции ветеранов боевых действий требуют смены парадигмы в соответствии с современными международными подходами, стандартами и практикой.

Ключевые слова: право, государственная политика в области социальной защиты, физическая реабилитация ветеранов боевых действий, реинтеграция ветеранов боевых действий, социальная защита ветеранов боевых действий, экономический механизм.

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FEATURES AND PROBLEMS OF POST-PRISON ADAPTATION OF JUVENILE CONVICTS: METHODS AND WAYS TO OVERCOME THEM

Abstract. The article analyzes the peculiarities of the adaptation of convicts, as well as identifies the main problems faced by juvenile convicts in the post-prison period. The author of the article will determine that the post-prison adaptation of juvenile convicts released from the educational colony of the Federal Penitentiary Service of Russia must have, and has a preventive, rehabilitation and restorative character. It, in turn, should be focused on their cultural, moral, socio-economic, psychological, as well as the legal formation of personality in modern society.

The scientific article presents the empirical material of the author's sociological study conducted in two research stages: The first stage - the Main - 2014–2018 and the Second stage - Panel research - 2019–2020: 1) the problems faced by the convict during the period of serving the criminal punishment in the form of imprisonment and the post-prison period (from the personal experience of the convict); 2) the effectiveness (inefficiency) implemented by socio-pedagogical, socio-psychological, civil law, health measures in the institutions of the Federal Penitentiary Service of Russia; 3) adaptive penitentiary technologies implemented in the Federal Penitentiary Service of Russia in relation to minor convicts (2014–2020).

Study sample: Convicts in FSI "CC-7" and FSI "CC-7" of the Federal Penitentiary Service of Russia in the Tula Region (n = 860 respondents), including the results of in-depth interviews of convicts (n = 34). Age of respondents: 18 - 65 years; Panel study conducted remotely in 2019–2020. Continuous questionnaire survey (n = 190), including the results of in-depth interviews of convicts (n = 23). Panel study conducted remotely in 2019–2020. Continuous questionnaire survey (n = 223 convicted minors), including the results of an in-depth interview of convicts (n = 31). The age category of respondents is 21–35 years old / 35–50 years old; Panel study conducted remotely in 2019–2020. A continuous survey using the questionnaire survey method (n = 172), including the results of an in-depth interview of experts (n = 37).

The study revealed - Twelve main problems that convicts in one way or another face in the post-prison period. Next, we conduct a ranking of identified problems by degree of importance, affecting the negative component of the convict in a given period, which forms the main trajectory of the social adaptation of the convict in modern Russian society.

So, according to the author, the totality of all the main problems that juvenile convicts face in the post-prison period, one way or another, significantly complicates the adequate process of social adaptation of the convict and leads to the fact that the teenager, having criminal experience, and also disappointed in life, repeatedly involved in criminal activity, which will directly lead him back to prison.

Also, based on an analysis of the positive practices for preparing convicts for release implemented in the penitentiary institutions of the Federal Penitentiary Service of Russia, it is possible to clearly establish the approximate composition of the subjects of social adaptation of convicts in the post-prison period.

These entities may be recommended by the Federal Executive Body (the Ministry of Justice of the Russian Federation) to implement complex issues related to the rehabilitation of juvenile convicts.

Based on a sociological study, the author develops the main ways and methods that focus on the successful social adaptation of prisoners in the post-prison period. The main conclusions of the study are formulated, which are as follows: 1) The post-penitentiary adaptation of a convict who has been released from FSI "EC" in the Federal Penitentiary Service of Russia represents a whole complex of life tasks that the released person will have to solve independently; 2) In some cases, to solve these problems it is necessary to "start life anew" - first of all, to acquire a

profession; 3) Rebuild the familiar “scenario” of deviant behavior in relation to others and the system of basic values.

Key words: Federal state institution "Correctional Colony", Federal state institution "Colony of settlement", Federal state institution "Criminal Executive Inspection", the main problems of prisoners in the post-prison period, social adaptation of a minor convict, post-prison adaptation, the personality of a teenager, “Adequate conditions of the convict’s external social and domestic environment”, prison conditions of the Federal Penitentiary Service of Russia, "Self-regulation and prediction of the social behavior of the personality of the convict".

The most urgent in pedagogical, sociological and legal science in the first positions remains the problem of ensuring the post-prison adaptation of convicts, especially minors released from prison, and the prevention of recidivism. In the absence of individual support for consistent penitentiary re-socialization and social adaptation in the post-penitentiary period, persons released from places of deprivation of liberty will experience social and psychological degradation, as well as an increase in recidivism with or without an organized criminal group.

The term “*adaptation*” itself, translated from Latin as “*adaptatio*” means “*adaptation*”, it is widely used in various sciences and means the adaptation of any subject or object to changing environmental conditions [17, p.20]. Also, in many explanatory dictionaries, “adaptation” refers to the adaptation of an individual to dynamically changing modern conditions [10, p.122]. Accordingly, the adaptation of a person released from places of deprivation of liberty implies his adaptation to a specific social environment, to the norms and rules of behavior accepted in society.

The post-penitentiary adaptation of juvenile convicts released from the educational colony of the Federal Penitentiary Service of Russia must have, and has, a preventive, rehabilitative and restorative character. It should be focused on their cultural, moral, socio-economic, psychological, as well as the legal formation of the individual in modern society. In the process of research, we propose a particular hypothesis: if a teenager who has been released from places of deprivation of liberty during the penal period does not decide what he will do, what social functions he will perform, one way or another he will certainly replenish the marginalized environment. In this environment, he will feel more comfortable, relying on the support of criminal comrades. Naturally, these comrades will expect a mutual response from him.

So, the process of post-prison adaptation of juvenile convicts released from prison is divided into two stages: the first is the preparation of a convict for exemption from serving a criminal sentence from the “EC” of the Federal Penitentiary Service of Russia, we define him as a “penal” stage. The second stage of “post-prison” is the provision of assistance to a liberated teenager in admission to a vocational educational institution: college, or to a general secondary (shift) school for the development of full secondary education; and also, rendering the convict medical and psychological rehabilitation assistance; ensuring his contacts with relatives and relatives; providing him with work and housing (including registration at the place of residence or place of stay).

According to Professor S.V. Bogdanova, “... the process of post-prison adaptation is one of the main directions in the fight against recidivism in adolescence. It should be noted that the rate of recurrence of juvenile delinquency is quite high, which is usually explained by judicial errors in the process of considering criminal cases involving minors. As well as the obvious shortcomings of the organization of the socio-pedagogical and psychological process in the educational colonies of the Federal Penitentiary Service of Russia. The deviant (delinquent) behavior of the convicted person in the post-prison period depends not only and, perhaps, not so much on the results of the punitive and educational impact in the Russian criminal system, but on the influence of the emerging factors of post-prison adaptation on him, since the problems of employment, the definition of permanent residence , etc. Some of them help to consolidate the results of corrective and educational impact, while others, on the contrary, provoke new crimes” [8].

In our opinion, “post-prison adaptation” implies adaptation - the unimpeded entry of a convicted person who has been released from prison to independent life in modern Russian conditions through the provision of post-prison assistance, regulated by Chapter 22 of Art. 181 Penal Code of the Russian Federation (1997) [5]. Also, the post-prison adaptation of persons released from places of deprivation of liberty is a key link in the Concept for the Development of the Criminal Executive System of the Russian Federation until 2020 [6]. The very process of post-prison adaptation of a minor convict who has served a

criminal sentence of imprisonment is complicated and is understood differently both in Russia and in other countries of the world.

Meanwhile, the process of "post-prison adaptation" of a minor convict requires legal regulation, since its participants are not only convicts released from places of deprivation of liberty, but also other persons who were under criminal prosecution, but who received an alternative measure of punishment from deprivation of liberty. This is a whole complex of diverse social institutions that are direct agents of the post-prison adaptation of the convict. These are the bodies of social protection of the population, agencies of labor and employment, production, educational organizations, etc.

At the same time, the legislator - the Parliament of the Russian Federation has not yet determined specific forms of inclusion in the public life of a teenager who has been released from prison [15, p.244].

Finding himself in an unfavorable situation, a convict who has been released from places of deprivation of liberty, for which everything has been determined by state criminal executive standards for several years, without receiving the expected help, is likely to be involved in a criminal environment that is oriented towards illegal actions. Or will he commit offenses alone, out of hopelessness, since there is no support for the family and close relatives, in his opinion there is no state support?

This opinion is shared by 85.2% of 100% of convicted respondents who are in FSI «CC-2», FSI «CC-7»of the Federal Penitentiary Service of Russia in the Tula Region and convicts (n = 860), and 90.7% of 100% interviewed convicted respectively, located in FSI «CC-35», FSI «CC-40», FSI «CC-2», FSI «MCF-42», FSI «CC-44» of the Federal Penitentiary Service of Russia in the Kemerovo Region; FSI «CC-8», FSI «CC-15», FSI "Colony of Settlement - 22" of the Federal Penitentiary Service of Russia in the Novosibirsk Region; FSI «CC-3», FSI «CC-4» of the Federal Penitentiary Service of Russia in the Tomsk Region - a panel study conducted remotely in 2019–2020. - continuous survey by questioning method (n = 764). Age of respondents: 18 - 19 years old / 20 - 35 years old / 35 - 65 years old. These are persons repeatedly convicted to real and long terms of imprisonment for committing grave and especially grave crimes. They are also people with extensive criminal experience, among them there are three "thieves in law" - "crowned" [20-35].

In order to familiarize a minor convict who has been released from prison with an adequate (independent) life in society, teach him how to overcome the difficulties that arise at that time, conflicts that inevitably arise in everyday life, complex re-socializing measures are being held in all penitentiary institutions of the Federal Penitentiary Service of Russia "In schools to prepare for the release of convicts". Also, when implementing a system of measures for the implementation of post-prison adaptation of the Federal Penitentiary Institution of the Federal Penitentiary Institution of the Federal Penitentiary Service of Russia, the success of juvenile convicts in the penitentiary period in preparation for the release of the Federal Penitentiary Service "EC" of the Federal Penitentiary Service of Russia is taken into account. Such training in all institutions of the Federal Penitentiary Service of Russia is carried out in the last six months of the stay of a minor convict in a colony. It includes a list of activities that provide the released teenager with conditions for the implementation of his successful social adaptation in the post-prison period [Part 5 of Article 132 of the Penal Code of the Russian Federation; Order of the Ministry of Justice of the Russian Federation dated January 13, 2006 No. 2].

At this stage, the administration of the FSI "EC" of the Federal Penitentiary Service of Russia, where the minor convict is serving his term, determines first of all where, after being released from the educational colony, the teenager will go for permanent residence. After this, contact is established with the parents, close relatives of the convicted person, as well as with the internal affairs bodies and employment services of the city and district administrations in whose territory the convicted person is going to reside. The possibility of continuing a teenager to study at a vocational educational institution - a college (secondary school) or employment is determined. In addition, the administration of the penitentiary institution of the Federal Penitentiary Service of Russia identifies which documents necessary for civilian life are missing from a convicted teenager (passport, pension certificate, other documents related to professional training), and takes measures to restore lost documents free of charge [13,15].

Also, the administration of the FSI "EC" of the Federal Penitentiary Service of Russia necessarily makes inquiries at the colony's pupil's former place of residence in order to establish the relations of the convict with his family, relatives and relatives, guardians, or the boarding school if the teenager is an orphan. If these ties have been lost, help restore them. Organizational and explanatory work is carried out with convicts preparing for the release on domestic and labor arrangements after the release of the Federal

Penitentiary Service of the Federal Penitentiary Service of Russia. Other measures are also being taken to help normalize or restore social ties with the outside world.

In the last penal period before being released for six months, the minor convict has no restrictions on short-term visits with relatives and relatives, and in receiving parcels and programs. The convicted person transfers to preferential conditions of detention in the penitentiary institution of the Federal Penitentiary Service of Russia, where the maintenance and life is oriented towards safe penal re-socialization [Part 5, Art. 132 of the PEC RF].

Already at the preparatory stage for the release of the teenager from the educational colony, in the implementation of the above measures, a number of problems arise that can nullify all efforts to implement successful social adaptation of the person in the post-prison period if they are not solved precisely at the final stage of the prisoner's re-socialization of the convict [9].

Criminal punishment of a person related to real deprivation of liberty occurs with the separation of the convicted person from the usual social environment. This entails the weakening, and sometimes the complete loss of socially useful ties in society, as well as a significant limitation of the social roles performed by adolescents. The personality characteristics of the minor convict also change significantly - and not always for the better [15, p.245].

The execution of a criminal sentence of imprisonment primarily determines the need for penal adaptation of a minor convict to living conditions at the Federal Penitentiary Institution “EC” of the Federal Penitentiary Service of Russia, which is often associated with the assimilation of the morals of the criminal environment. So, according to experts participating in a sociological survey, after a teenager is released from places of deprivation of liberty and returned to his former social environment, adaptation problems arise even for those who committed a crime by chance, under the influence of adverse social circumstances. This opinion is shared by 100% of the convicted respondents. The fact is that for those who have served their sentence, the “institute” of criminal record is automatically triggered, restricting the rights of the teenager in employment or the possibility of his admission to an educational institution with a specialized military profile.

According to Professor S.V. Bogdanova [8], the main features of the post-prison adaptation of adolescent convicts who were released from the FSI “EC” of the Federal Penitentiary Service of Russia are the following:

1) The socio-psychological process starting from the moment the convicts are released and ending with the achievement of a correspondence between the expectations, requirements of modern society and the behavior of a previously convicted teenager;

2) A long, complex, sometimes contradictory process, orienting an individual to adapt to generally accepted laws, norms and legal regulations, moral values, moral rules and society in society. This process is inevitable: if the individual does not “integrate” into these rules of conduct or contradicts them, then it is more likely that society will not accept him and he will again be in prison;

3) The main task of the post-prison adaptation of convicts is to introduce them to an independent life in society without legal restrictions associated with the previously served criminal punishment in the form of imprisonment, as well as in the new and / or changed previous social environment. This introduction involves the free and voluntary submission of adolescents to the regulatory requirements and generally accepted rules of society;

4) Successful post-prison adaptation of teenage convicts released from places of deprivation of liberty, as well as the acquisition of new adaptation skills and abilities by them in the process of penitentiary adaptation at the Federal Penitentiary Institution “EC” of the Federal Penitentiary Service of Russia - this is the opinion of more than 94.7% of expert respondents.

5) Significant success in the post-prison adaptation of convicts depends on the correlation of the system of personal settings of the released person and the requirements of the environment - a peer team in a professional institution (school), labor collective, immediate household, family and friends - this is the opinion of more than 80.4% of expert respondents.

6) Successful post-prison adaptation of convicts can be ensured only if there is a positive, interdependent social orientation of the microenvironment and personality of the convicted teenager, compatibility of social expectations of the environment and moral positions, value orientation of the individual - this is the opinion of more than 97.8% of expert respondents [8,13].

Also, the passage of post-prison adaptation of the convict depends on many social and personal factors. Some of them contribute to the successful "entry" of the convict who has released from prison to a new or changed social environment, while others, on the contrary, prevent this. Teenagers who reject generally accepted norms and rules in society, as a rule, adhere to "criminal authority" - this is "retribution" to society. "Retribution", firstly, is because the society of the teenager did not accept for what it is. With all its flaws. This opinion is shared by more than 83.4% of expert respondents. Secondly, the rejection of established norms and rules occurs because the convict himself considers himself an inferior member of society. The personal factor - "low self-esteem" is the result of the failures and complete collapse in the process of becoming a person. This opinion is shared by more than 90.2% of expert respondents [13].

The most important personal factor on which the successful post-prison adaptation of the convict depends is the relationship between the dispositional structure of the personality of the convict. For example, "Self-regulation and prediction of the social behavior of an individual" (1979). The basis of the mechanism of formation of dispositions in the theory of V.A. Yadova (1979) put the scheme D.N. Uznadze, developed by him to explain the emergence of primary settings (set). It consisted in the fact that "... the integral dynamic state of the subject's readiness for a certain activity is determined by the needs of the subject and the objective situation - physiological needs [18,19] and social expectations of the environment.

Specific and no less acute is the problem associated with the re-socialization of teenage convicts who are being released from the "EC" of the Federal Penitentiary Service of Russia. The study of the personality of the convict at the time of release from the penitentiary institution of the Federal Penitentiary Service of Russia can be of great importance for solving the issue of combating recidivism in the post-prison period, since the problem of the social adaptation of a teenager released from prison to normal conditions in society is the main requirement of modern Russian society [8].

This is primarily due to the fact that after spending several years in prison, the convicted person partially or completely loses the ability to socially adapt in one or another sphere of life. Or he "misses" the favorable ("*sensitive*") period for the normal formation and development of abilities. As a teenager develops, he is forced to solve the problems of his own growing up, and a factor in the social environment of the convicted person plays a significant role in their prompt and correct solution. As a result, the normal solution of the problems of growing up by convicts in the penitentiary institutions of the Federal Penitentiary Service of Russia with the restriction of socially useful contacts becomes difficult and even impossible [8,13].

The social (domestic) conditions of independent life after the convict is released from the "EC" of the Federal Penitentiary Service of Russia appear to the adolescent as new problems requiring a lot of tension and endurance (stress resistance) from him. This opinion is shared by 96.5% of convicted respondents - and only 3.5% of convicted respondents are confident that they will succeed.

The former pupil of the colony is often not ready to make the right decisions to resolve a particular issue. Convicted juveniles who were released from places of deprivation of liberty are not able to independently resolve issues related to domestic appliances and independent housekeeping. This opinion is shared by 98.7% of expert respondents. And only 1.3% of expert respondents have confidence that they will succeed. This confidence is due to the fact that the staff and teachers of educational colonies are actively working on the formation of pupils as individuals. We are convinced that our work is not in vain. And even one of our pupils, having passed a difficult, harsh path, will become a Man. We believe in it and hope so! This, of course, is primarily due to the fact that these adolescents lack life experience (they were convicted at 14-15 years old). In addition, of course, there are no real conditions in which a teenager could realize himself as an owner, business executive and family man [12,13].

Uncertainty in a particular life situation in the former colony inmates causes inadequate, often affective reactions to environmental circumstances. Difficult life circumstances in the convict's family, inability to find a job, lack of a permanent home, the emergence of new "criminal cronies", etc. All this can result in the commission of criminal offenses, the consequences of which the offender is often not aware. Often this can be aggravated by the wrong attitude of others to former convicts, which, of course, "leads" the teenager into certain psychological "frames" - the teenager feels insecure, "driven", not needed by society. All together leads to incorrect assessments of oneself and other convicts, and, as a result, to rash actions. This opinion is shared by 94% of expert respondents. 5% of expert respondents found it

difficult to comment on the life circumstances of the convict in the post-prison period. And only 1% of expert respondents are convinced that they will be able to refrain from the negative influence of new "criminal comrades", and they are convinced that, even if not immediately, they will be able to cope with their life problems that arise in the post-prison period [12,13].

The process of post-penitentiary adaptation of an individual to the conditions of normal existence in society after being released from prison depends on three main groups of factors:

1. The identity of the teenager released from prison; his moral position, internal motivation for behavior, self-control, conscience, a sense of personal dignity, etc. [8] - this opinion is shared by100% of expert respondents;

2. "Adequate conditions of the external social and domestic environment of the convicted person" is, first of all: *1)* the presence of a permanent home (registration at the place of residence); *2)* the presence of a family and a favorable relationship with her teenager; *3)* the availability of a place of study at school or college; *4)* the presence of full or partial employment and satisfaction with work and wages; *5)* relationships with the labor collective, relations with members of small (reference) groups, etc. [8], - this opinion is shared by 100% of expert respondents;

3. The penal conditions of the Federal Penitentiary Service of Russia, in which there was a minor convict in the process of serving a criminal sentence of imprisonment. For the most part, it is about how a teenager mastered penal re-socialization, what basic social, educational, professional, labor skills a pupil of the colony mastered and which, of course, affect his personal behavior in society, as well as social adaptation in the first months of the post-prison period [8]. In our opinion, this is a very difficult period in the socio-psychological and everyday life in the life of a teenager after being released from prison. This opinion is shared by 100% of expert respondents [13].

In the course of our research (conducted in 2014-2018 and in 2019-2020), the main problems that juvenile prisoners faced in the post-prison period were identified were identified:

1) Lack of social and domestic skills for an independent life in the post-prison period - 96.5% of prisoners;

2) The presence of difficulties in relationships in the family - 87% of convicts, 10% of orphans, former pupils of boarding schools;

3) The presence of an outstanding criminal record - 100% of convicts;

4) Obstacles to employment in state institutions (for municipal or state service), as well as upon admission to training at specialized universities, or undergoing urgent (contract) service in the ranks of the Russian army;

5) The presence of certain difficulties in finding employment in the post-prison period - 100% of convicts;

6) The negative influence on the adolescent from the side of "criminal friends", joining the "marginal groups", maintaining an antisocial lifestyle - all this gives rise to recidivism - 58.8% of the convicted;

7) The presence of dependence, which is manifested in the use of alcohol, narcotic and psychotropic substances, - 44.5% of convicts;

8) Lack of material wealth in the family of the convict, lack of employment of family members or the immoral lifestyle of parents - 53.6% of convicts;

9) Lack of permanent residence - more than 35% of prisoners. As a rule, these are 10% orphans. 25% of convicts during the period of serving a criminal sentence in prisons lose contact with relatives and relatives. At the time of release from the colony, the teenager is left alone with all the ensuing life problems, such as, relatives have turned away from him, or they are also in prison;

10) The lack of professional competence required by the employer in modern market conditions and during the period of economic and political sanctions by Western countries in relation to Russia. This directly affects the demand for labor - 100% of prisoners;

11) The presence of chronic diseases in a minor convict, including childhood disability - 42.8% of convicts. As well as the lack of the opportunity to receive free qualified psychological and medical assistance during the stay of the convicted person in prison. This is reflected in the physical and psychological state of the adolescent in the post-prison period - 78.5% of prisoners;

12) Lack of qualified legal assistance in the post-prison period - 100% of convicts [12,13,14].

The combination of all the main problems that juvenile convicts face in one way or another in the post-prison period significantly complicates the adequate process of social adaptation of the convict and

leads to the fact that the teenager, having criminal experience and also disappointed in life, is re-involved in criminal activity, which will directly lead him back to prison.

According to the results of a survey of convicted respondents preparing to be released from places of deprivation of liberty (including on parole), it can be noted that juvenile convicts do not intend to return to their previous criminal and asocial way of life. Today, this is evident from the respondents' gas, adolescents objectively assess their chances of success in the process of social adaptation in the post-prison period. They point to today's cramped circumstances in which they are.

96% of convicted respondents do not intend to return to the criminal past: "We realized a lot only here in the colony; we also learned to value personal freedom; learned to respect and value the freedom and rights of individuals in society. We have realized the moral and material value of our harm to the victims. Only today, being here, in an educational colony, did we really realize parental love and care for us - before the colony, for us this was not a value. We did not notice at all that someone cares, worries and worries about us. Now for us, obviously, it was the parents who always worried about us. In my free time, I always think about how the meeting with my parents will take place; Will they forgive me for who I will be in the near future. But I certainly know that I will not be friends with former comrades! I will not return to the marginal environment. I'll continue my college education and will work. If possible, I will help my parents!" [13].

This is the opinion of prisoners in educational colonies preparing for release. Only 3% of convicts today doubt the success of social adaptation in the post-prison period.

Today, 1% of convicted respondents found it difficult to reflect on their future, arguing that they did not know what their fate would be like after the release of the Russian Federal Penitentiary Service from "EC". Today they do not have confident support from relatives and friends, but they still hope for the best.

The picture changes significantly when interviewing convicted respondents with multiple convictions. Only 18% of convicts still hope for a successful social adaptation in the post-prison period, citing this with great experience [13].

Here are examples of such judgments: "We already know how to behave after being released from the "colony". They are waiting for us at home, there is a wife "part-time" (registered here in "CC-2"; "CC-7"), we plan to give birth to children (wife in position; wife brings up one children). Life has become better understood. I hope that the "friends" will help get settled in life. There are certain savings, including from a criminal transaction. Health is no longer something to spend the rest of your life in "prisons", and you don't want to die in the colony!

78% of convicted men between the ages of 30 – 55 years old today doubt the success of social adaptation in the post-prison period.

Here are some more examples of prisoners' stories: "I have several "walkers" behind me, and each time I have exchanged my freedom with a "prison", for various reasons. This lack of permanent work – living on odd jobs, and the absence of permanent housing, the absence of his own family, and normal friends – was with his companions. So I was drawn into a criminal life from hopelessness, was involved in organized crime groups, small entrepreneurs were robbed and killed, etc. Yes, and so the "people" got it from me, I see no reason to spoil the weather with my presence in the wild, I'm fine here, I'm adapted, but what is waiting for me to be free? Right. Nothing good!

And only 4% of the convicted respondents doubt, but also hope for luck, that after all, after their release from the correctional colony, something will work out. But at the same time, the convicted respondents generally do not hope for help and support from relatives and relatives, since contacts have long been lost. First of all, I will try to decide on the housing and residence permit in the hostel, then find a job as a private trader, and then everything will be visible. I'll try not to return to the past, although there will be many temptations, and the prospects are not so bright. I lost everything: home, family; I betrayed good friends, I even killed one of them. Who will help me now after all that I have done? Right. No one! Do I repent? In the beginning, there was practically no feeling of remorse, it was just anger. Now, after years spent in a maximum security colony, I realize that I did a lot of evil. Only now I understand what people have experienced, that they are probably now very ill without their loved ones, whom I took their lives. This is a big loss for any person who has lost a relative. A loss that cannot be made up for [12,13].

With a similar sample of the panel study (2019–2020), the situation does not change significantly, for example, 29% of respondent-convicts still hope for a successful social adaptation in the post-prison period.

64% – convicted men and women in prison, doubt the success of social adaptation in the post-prison period, and only 7% – respondent convicts, doubt, but also hope for luck in social adaptation in the post-prison period, because, hope for support from their friends and close relatives [12,13].

The post-penitentiary adaptation of juvenile convicts released from places of deprivation of liberty should contain two basic aspects: "social" and "legal", this will be due to the prevention of social (behavioral) deviations from the subject of criminal enforcement law. Thus, in order to understand what a successful adaptation of a convicted person in the post-prison period should be, it is necessary to build a unified generalized theoretical scheme in which all of these aspects should be adequately reflected as elements of the system. And for this scheme to have the possibility of practical implementation, the following conditions are necessary: firstly, the effect of social adaptation in the post-prison period of convicts will be ensured if the employees of the rehabilitation center (departmental or non-profit organization), while working with the convict, take into account the meaningful characteristics of all possible risks in the process of adaptation - namely: *1)* the convict's lack of social and domestic skills for independent living; *2)* the presence of difficulties in relationships in the family of a teenager; *3)* the negative impact on the teenager from the side of "criminal friends" and other "marginalized groups"; *4)* the convict has various dependencies; *5)* the presence of insufficient professional competence; *6)* the presence of chronic diseases in a teenager; *7)* the absence of any living conditions and other problematic factors affecting the behavior of the convict in society. On the basis of this, it is recommended to build a "road map" ("individual program") for the implementation of socializing measures that increase the social competence of the convicted person in the post-prison period.

Secondly, the effectiveness of post-prison adaptation of juvenile offenders in the post-prison period will be achieved if, with the help of a probation service for convicts released from places of deprivation of liberty, it becomes mandatory to stay in a rehabilitation center for 5-6 months after being released from the Federal Penitentiary Institution "EC" of the Federal Penitentiary Service of Russia. At the first stage, it is possible to launch a pilot project in several constituent entities of the Russian Federation, for example: in Moscow, St. Petersburg, Sevastopol, Moscow, Leningrad, Kaliningrad, Novosibirsk Tomsk regions, in the Khabarovsk Territory. They will implement state policy on the post-prison adaptation of prisoners [13,14].

Also, according to the results of a survey of convicted respondents preparing to be released from places of deprivation of liberty, including on parole, and experts, it was revealed that today the legislative framework in the field of criminal executive law needs to be supplemented with new legal instruments. First of all, they should focus on the establishment of the probation institution in the Russian Federation, as well as contribute to a positive final result of the work of the penal system of Russia [defined in Part 1 of Art. 9 PEC RF].

When asked whether there is a need to adopt a new Federal Law "On Probation Service in the Russian Federation" and how respondents-convicts located in the "EC" of the Russian Federal Penitentiary Service imagine it, they replied that they were more concerned about the "prospect" of repeated imprisonment. When asked about the appointment to the FSP Russia rehabilitation center, the respondent-convicts answered that they equate compulsory stay for 6 months after their release at the FSP Russian rehabilitation center with serving a sentence.

When asked about the appointment to the rehabilitation center of the Federal Probation Service of Russia, the respondent-convicts answered that they equate compulsory stay for 6 months after their release in the rehabilitation center of the FPS of Russia with serving a sentence. Therefore, I had to explain what this stay really means, what kind of services sector those released from prison will receive from the state. And that the concept of "rehabilitation" comes from the term "rehabilitated", which means "justified", "restored". As a result, according to convicts preparing for release, 87% of respondent prisoners recognize the advisability of introducing this law in Russia. They are aware that they will be assisted in the preparation of personal documents, assistance will be rendered in employment. And also assistance will be provided in admission to college, and at the same time will not disclose information about the end of a comprehensive school in prisons. Moreover, some parents lead an immoral lifestyle or are in places of imprisonment. Some believe that being in the center will help them solve many problems.

However, 9% of convicted respondents doubt that everything is as it is written in the document. Of course, no one says that everything will be perfect! This is a completely new service that does not yet exist in Russia, but there is a very rich positive foreign experience, and many non-profit and religious organizations, including the Russian Orthodox Church (in many parishes, there have been rehabilitation

centers for individuals for over two decades having a certain dependence) today have such a practice. Practical experience in Russia is, however, unfortunately, not at the state level. 4% of the convicted respondents found it difficult to answer the questions posed, they also doubt that the state would really help them in the post-prison period.

Further, expert respondents from among the employees of educational colonies and regional departments of the FSIN of Russia note that this rule of law is needed in Russia. She would allow with good reason to act in the interests of a minor convict.

94% of expert respondents spoke of the need to adopt this law in the Russian Federation. This law will serve as an impulse for juvenile probation in Russia. And now the employees have "hands tied", sometimes they would be happy to help convicts preparing for release, but there is neither authority nor funds for this. And often a teenager is left alone with his problems. Often there is no education and the necessary qualifications, which is really in demand in the market of digital and information services, there is only an outstanding criminal record that impedes employment. And even worse, that "former friends" can drag a teenager pulling him into marginal groups - and again serving the sentence in the colony. Therefore, a probation service is needed in Russia! And her activity should first of all be aimed at the reintegration of this teenager.

5.5% of expert respondents do not see the need for extra spending by the state of money. There are also such "experts" who are of the opinion that if he stumbled and went to prison, then nothing good would come of such a person! He is a corrupt man, and his house is a prison. 1% of respondents found it difficult to answer these questions [12,13].

Also indifferent to the formation in the Russian Federation of a new executive authority at the Federal level are respondents who have been repeatedly sentenced to imprisonment, or who are currently in the FSI «CC» of the Federal Penitentiary Service of Russia. 64% of the respondents convicted for having this service appear in the Russian Federation because they know what difficulties those who have freed up after the first "walk" experience. This is both a lack of qualifications and a lack of support from both close relatives and government agencies.

They believe that such a service can protect at least minors from recidivism, help them in the first stage of post-prison adaptation. 29% of convicted respondents doubt that the state can and wants to help a person who has been released from prison. They doubt that real help will reach the convict - because this service will have to solve a lot of different issues, primarily related to the placement and full provision of those released. 7% of respondent prisoners found it difficult to answer this question.

With a similar sample of a panel study (2019–2020) of convicts in "CC" and "CS", the situation is changing in a positive direction, for example, 74% of respondent-convicts positively attributed to the fact that Russia will be formed The Federal Probation Service, which focuses on the post-prison adaptation of convicts released from prison.

The percentage of those who doubted that this service could be useful to them after being released from the penitentiary institution of the Federal Penitentiary Service of Russia decreased, 24% of the convicts participating in the survey made up such and only 3% of the polled convicts found it difficult to answer this question [12,13].

These entities may be recommended by the Federal Executive Body (the Ministry of Justice of the Russian Federation) to implement complex issues related to the rehabilitation of juvenile convicts.

Organizations such as: the Federal Probation Service of Russia, the Federal Treasury Institutions "Criminal Executive Inspections", penitentiary institutions and enterprises of the Federal Penitentiary Service of Russia, rehabilitation centers for training minors sentenced to release at the Federal Penitentiary Institution "EC" of the Federal Penitentiary Service of Russia, religious and public non-profit organizations with the right to attract various targeted grants, including grants from the President of the Russian Federation, for example, Order of the President of the Russian Federation of February 19, 2018 No. 32-rp.

The activities of these subjects of post-prison adaptation of juvenile convicts should be a continuous, multi-aspect and multi-level process of social rehabilitation of convicts, involving the application of the necessary comprehensive measures, varying in content, scope and mechanism of action [15,16].

The main ways and methods that focus on the successful social adaptation of prisoners in the post-prison period are as follows:

1) In all FPI “EC”, the Federal Penitentiary Service of the Russian Federation, it is recommended that measures be taken to facilitate the placement of juvenile offenders in the labor and domestic facilities within the framework of the School for the Preparation of Convicts for Release, with the participation of invited specialists in labor and employment, employers, representatives of nonprofit organizations and other competent specialists of municipal executive bodies authorities;

2) In the process of penitentiary adaptation, to form moral qualities and values among juvenile convicts - benevolence, justice, prudence, honesty and courage, fidelity, hard work, respect for elders, respect for the law, respect for others, etc.;

3) Conducting various events in the “EC” of the Federal Penitentiary Service of Russia with the participation of various non-profit and religious organizations orienting convicts in the post-prison period to successful social adaptation;

4) Formation of positive orientations in juvenile convicts, elimination of negative consequences, deliberate assimilation by convicts of new social (useful) roles in traditional society - for example, the profession, the role of family man, etc.;

5) Formation of socially adequate qualities - manifestations of tolerance for minorities, social, cultural, educational and legal skills of juvenile convicts;

6) Rendering post-prison assistance to adolescents - resolving employment issues, admission to training in a professional institution, resolving social and domestic and housing issues of a convicted person, restoring socially useful relations with relatives and relatives of a teenager, restoring the legal status of a citizen of the Russian Federation - drawing up the necessary documents, including, and passports of a citizen of the Russian Federation and much more [13,14].

Thus, we come to the following conclusions:

1) The post-penitentiary adaptation of a convict who has been released from the Federal Penitentiary Institution “EC” of the Federal Penitentiary Service of Russia is a whole complex of life tasks that the released person will have to solve independently;

2) In some cases, to solve these problems it is necessary to “start life anew” - first of all, to acquire a profession;

3) Rebuild the familiar “scenario” of deviant behavior in relation to others and the system of basic values [14].

However, it often happens that convicted adolescents, being in penitentiary institutions of the Federal Penitentiary Service of Russia, show hidden or explicit resistance to the educational process, this may be due to the lack of an image of a safe prospect outside the penal institution of the Russian penitentiary institution and the prevalence of infantile attitudes of this type, eg: “I don’t have to do anything, everything will be resolved by itself”, "Nothing dedends on me!", “I’m not capable of anything - I won’t do anything”, "We know all this - all the same, I go to the "adult"!".

At the same time, convicts who are in the penitentiary institutions of the Federal Penitentiary Service of Russia, due to the peculiarities of their age, are in a constant search for an ideal, authoritative person among adults.

As a rule, such people are guests of the FPI “EC” of the FSIN of Russia, for example, Yu.D. Kuklachev, constantly, visits educational colonies of the Federal Penitentiary Service of Russia with “Lessons of Kindness”, and various performances with his pets.

A social psychologist or a social teacher working in the penitentiary institution of the Federal Penitentiary Service of Russia, which pays attention not only to the socio-psychological correction of the behavior of the convict, but also to eliminate the lack of communication with adults, can also become an authority for convicted persons. A social psychologist or other civilian employee of FPI “EC” of the Federal Penitentiary Service of Russia - a teacher of a general education school or a master of a vocational school, with his benevolent attitude can help students in the colony change their outlook on certain values or the future, acquire an active moral position in relation to their life in the future [13,14,15].

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КӘМЕЛЕТКЕ ТОЛМАҒАН СОТТАЛҒАНДАРДЫ ПЕНИТЕНЦИАРДАН КЕЙІНГІ БЕЙІМДЕУДІҢ ЕРЕКШЕЛІКТЕРІ МЕН МӘСЕЛЕЛЕРІ: ЖЕҢУДІҢ ӘДІСТЕРІ МЕН ЖОЛДАРЫ

Аннотация. Мақалада сотталушының бейімделу ерекшеліктері талданады, сонымен қатар кәмелетке толмаған сотталғандар бойында түрмеден кейінгі кезеңде кездесетін негізгі мәселелер анықталған. Мақала авторы Ресей Федералды пенитенциарлық қызметінің оқу колониясынан босатылған кәмелетке толмаған сотталғандардың пенитенциарлық бейімделудің алдын алу, оңалту және қалпына келтіру жағдайын анықтайды. Бұл, өз кезегінде, қазіргі қоғамдағы тұлғаның құқықтық қалыптасуына, мәдени, моральдық, әлеуметтік-экономикалық, психологиялық, сондай-ақ жеке тұлғаның құқықтық қалыптасуына бағытталуы қажет.

Ғылыми мақалада автордың екі зерттеу кезеңінде жүргізілген социологиялық зерттеудің эмпирикалық материалы ұсынылған: бірінші кезең – негізгі – 2014-2018 жылдар және екінші кезең – панельдік зерттеулер – 2019-2020 жж. Социологиялық зерттеудің мақсаты: анықтау және талдау: 1) бас бостандығынан айыру түріндегі қылмыстық жазаны өтеу және жазадан кейінгі мерзім ішінде сотталушы мәселелері (сотталушының жеке тәжірибесінен); 2) Ресей Федералды қылмыстық-атқару қызметі мекемелерінде әлеуметтік-педагогикалық, әлеуметтік-психологиялық, азаматтық-құқықтық, денсаулық сақтау шаралары жүзеге асыратын тиімділік (тиімсіздік); 3) Ресей Федералды қылмыстық-атқару қызметінде кәмелетке толмаған сотталғандарға қатысты қолданылатын пенитенциарлық бейімдеу технологиялары (2014-2020 жж.).

Зерттеу үлгісі:

– Ресей Федерациясының Тула облысындағы Федералды пенитенциарлық қызметінің «ИК-2» және «ИК-7» ФКУ-да сотталғандар (n=860 респондент), оның ішінде сотталғандар сұхбатының нәтижесі (n = 34). Респондент жасы: 18-65 жас;

– панельдік зерттеу 2019-2020 жылдары қашықтан жүргізілді. Сотталғандар сұхбатымен қоса (n = 190) үздіксіз сауалнамалар нәтижесі (n = 190). Респондент жасы – 18-19 жас;

– панельдік зерттеу 2019-2020 қашықтан жылдары жүргізілді. Сотталғандар сұхбатының нәтижесімен қоса (n = 223 кәмелетке толмаған сотталғандарға қатысты) үздіксіз сауалнама жүргізу (n = 31) нәтижесі. Респонденттің жас санаты: 21-35 жас / 35-50 жас;

– панельдік зерттеу қашықтан 2019-2020 жылдары жүргізілді. Анкеталық зерттеу әдісін (n = 172) пайдалана отырып, үздіксіз сауалнама, оның ішінде сарапшылар сұхбатының нәтижелері (n = 37).

Зерттеу барысында түрмеден кейінгі кезеңде сотталғандардың қандай да бір жолмен немесе басқа жолмен кездесетін он екі негізгі мәселесі анықталды. Арықарай біз анықтаған мәселелерді қазіргі Ресей қоғамындағы сотталушының әлеуметтік бейімделуінің негізгі траекториясын қамтитын белгілі бір кезеңдегі сотталушының құрамына теріс әсер ететін маңыздылық дәрежесі бойынша рейтинг жүргіземіз.

Автордың пікірінше, кәмелетке толмаған сотталғандардың түрмеден кейінгі кезеңде кездесетін барлық негізгі мәселелерінің жиынтығы сотталушының әлеуметтік бейімделу үдерісін едәуір қиындатады және қылмыс жасау барысында тәжірибесі бар жасөспірімнің сағы сынбайтындықтан ол тағы да түрмеге түсіретін қылмыстық әрекетке қатысады.

Сондай-ақ, Ресей Федералды пенитенциарлық қызметінің пенитенциарлық мекемелерінде жүзеге асырылған сотталғандарды босатуға дайындаудың оң тәжірибесін талдау негізінде түрмеден кейінгі кезеңде сотталғандарды әлеуметтік бейімдеу субъектілерінің болжамды құрамын нақты анықтауға болады. Бұл заңды тұлғаларға федералды атқарушы орган (Ресей Федерациясының Әділет министрлігі) кәмелетке толмаған сотталғандарды оңалтуға байланысты күрделі мәселелерді шешу барысында ұсынылуы мүмкін.

Социологиялық зерттеу негізінде автор түрмеден кейінгі кезеңде сотталушылардың әлеуметтік бейімделуіне бағытталған негізгі әдістері мен жолдарын айқындайды.

Зерттеудің негізгі тұжырымдары мынадай: 1) Ресей Федералды қылмыстық-атқару қызметі «ВК» Федералды қылмыстық-атқару мекемесінен босатылған сотталушыны пенитенциардан кейінгі бейімдеу босатылған адамның өз бетінше шешетін өмірлік міндеттердің жиынтығын қамтиды; 2) кейбір жағдайда осы мәселелерді шешу үшін «өмірді жаңадан бастау» керек, ең алдымен, мамандық алу мәселесі негізге алынады; 3) өзге адамдарға және негізгі құндылықтар жүйесіне қатысты девиантты мінез-құлықтың «сценарийін» қалпына келтіру қажеттілігі туындайды.

Түйін сөздер: «Түзеу колониясы» федералды мемлекеттік мекемесі, «Елдімекен» федералды мемлекеттік мекемесі, «Қылмыстық-атқару инспекциясы» федералды мемлекеттік мекемесі, сотталғаннан

кейінгі кезеңдегі негізгі проблемалар, кәмелетке толмаған сотталушының әлеуметтік бейімделуі, түрмеден кейінгі бейімделу, жасөспірім тұлғасы, сотталушының сыртқы әлеуметтік және тұрмыстық жағдайының шарттары, Ресей Федерациясының Қылмыстық атқару қызметі түрмелеріндегі жағдай, өзін-өзі реттеу және сотталушының жеке басының әлеуметтік мінез-құлқын болжау.

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ОСОБЕННОСТИ И ПРОБЛЕМЫ ПОСТПЕНИТЕНЦИАРНОЙ АДАПТАЦИИ НЕСОВЕРШЕННОЛЕТНИХ ОСУЖДЁННЫХ: МЕТОДЫ И ПУТИ ИХ ПРЕОДОЛЕНИЯ

Аннотация. В статье анализируются особенности адаптации осуждённых, а также выявляются основные проблемы, с которыми сталкиваются несовершеннолетние осуждённые в постпенитенциарный период. Автором статьи определяется, что постпенитенциарная адаптация несовершеннолетних осуждённых, освободившихся из воспитательной колонии ФСИН России, должна иметь, и имеет профилактический, реабилитационный и восстановительный характер. Она должна в свою очередь быть ориентирована на их культурно-нравственное, социально-экономическое, психологическое, а также правовое становление личности в современном обществе.

В научной статье представлен эмпирический материал авторского социологического исследования, проведённого в два исследовательских этапа: Первый этап – Основной – 2014–2018 годы и Второй этап – Панельное исследование – 2019-2020 годы. Целью социологического исследования является выявление и анализ: 1) проблем, с которыми сталкиваются осуждённый в период отбывания уголовного наказания в виде лишения свободы и постпенитенциарный период (из личного опыта осуждённого); 2) эффективности (неэффективности), реализуемых социально-педагогических, социально-психологических, гражданско-правовых, медико-санитарных мероприятий в учреждениях ФСИН России; 3) адаптивных пенитенциарных технологий, реализуемых в ФСИН России в отношении несовершеннолетних осуждённых (2014–2020 годы).

Выборка исследования: осуждённые, находящиеся в ФКУ «ИК–2» и ФКУ «ИК–7» УФСИН России по Тульской области (n = 860 респондентов), в т.ч., и результаты глубинного интервью осуждённых (n=34). Возраст респондентов: 18 – 65 лет;

Панельное исследование, проведённое дистанционно в 2019–2020 гг. – сплошной опрос методом анкетирования (n=190), в т.ч., и результаты глубинного интервью осуждённых (n=23). Возраст респондентов 18 – 19 лет;

Панельное исследование, проведённое дистанционно в 2019–2020 гг. – сплошной опрос методом анкетирования (n=223 осуждённых в несовершеннолетнем возрасте), в т.ч., и результаты глубинного интервью осуждённых (n=31). Возрастная категория респондентов 21 – 35 лет / 35 – 50 лет;

Панельное исследование, проведённое дистанционно в 2019–2020 гг. Сплошной опрос методом анкетирования (n=172), в т.ч., и результаты глубинного интервью экспертов (n=37).

В ходе исследования выявлено – Двенадцать основных проблем, с которыми так или иначе осуждённые сталкиваются в постпенитенциарный период. Далее мы проводим ранжирование выявленных проблем по степени значимости, влияющие на негативную составляющую осуждённого в данный период, которая и формирует основную траекторию социальной адаптации осуждённого в современном российском обществе.

Так, по мнению автора, совокупность всех основных проблем, с которыми, так или иначе, сталкиваются несовершеннолетние осуждённые в постпенитенциарный период, существенно затрудняют адекватный процесс социальной адаптации осуждённого и приводит к тому, что подросток, имея криминальный опыт, а также разочаровавшийся в жизни, повторно вовлекается в преступную деятельность, что непосредственно приведёт его вновь в места лишения свободы.

Также на основе анализа положительных практик по подготовке осуждённых к освобождению, реализуемых в пенитенциарных учреждениях ФСИН России, можно чётко установить примерный состав субъектов социальной адаптации осуждённых в постпенитенциарный период. Этим субъектам Федеральным органом исполнительной власти (Министерством юстиции РФ) может быть рекомендовано, осуществлять реализацию комплексных вопросов по реабилитации несовершеннолетних осуждённых.

На основании проведённого социологического исследования автором разрабатываются основные пути и методы, ориентирующие на успешную социальную адаптацию осуждённых в постпенитенциарный период.

Формулируются основные выводы по проведённому исследованию, которые заключаются в следующем: 1) постпенитенциарная адаптация осуждённого, освободившегося из ФКУ «ВК» ФСИН России,

представляет собой целый комплекс жизненных задач, которые освободившемуся придётся решать самостоятельно; 2) в ряде случаев для решения данных задач необходимо «начать жизнь сначала» – прежде всего, приобрести профессию; 3) перестроить ставший привычным «сценарий» девиантного поведения по отношению окружающих и систему базисных ценностей.

Ключевые слова: федеральное казённое учреждение «Исправительная колония», федеральное казённое учреждение «Колония поселения», ФКУ «Уголовно-исполнительная инспекция», основные проблемы осуждённых в постпенитенциарный период, социальная адаптация несовершеннолетнего осуждённого, постпенитенциарная адаптация, личность подростка, «Адекватных условий внешней социальной и бытовой среды осуждённого», пенитенциарные условия ФСИН России, «Саморегуляция и прогнозирование социального поведения личности осуждённого».

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THE RELATIONSHIP BETWEEN EMOTIONAL INTELLIGENCE AND ACADEMIC ACHIEVEMENT AMONG UNDERGRADUATE STUDENTS IN KAZAKHSTAN

Abstract. While academic achievement and performance of students in higher education settings continue to be crucial, there is a growing emphasis internationally on the acquisition of non-cognitive skills of future specialists. Perhaps, one of the most widely discussed soft skills is Emotional Intelligence ("EI"). Despite being recognized as an independent concept since the second part of the twentieth century, most experts in the spheres of psychology, education and management still find this area somewhat ambiguous. Several studies focused on the relationship between emotional intelligence and academic achievement before. However, very little research in this sphere has been conducted in Kazakhstan. While the gap in scholarship is evident, the praxis is also underdeveloped.

This study utilized a cross-sectional correlational design [1,2,3]. The purpose of the study was to identify the relationship between emotional intelligence and academic achievement among undergraduate students. To achieve this, we administered the ESAP (Emotional Skills Assessment Process) questionnaire that focuses on four main competencies: interpersonal, leadership, self-management, and intrapersonal. We used the self-reported indicators to obtain information about students' academic achievement.

We collected data in two Kazakhstani universities for confidentiality purposes called the Autonomous University and the Regional University. The sample consisted of 239 undergraduate students, 141 and 98 undergraduates from two universities (Regional and Autonomous), respectively. The sample was recruited on a non-probability basis due to the voluntary participation in the research study and the unavailability of the sampling frames. We used the Statistical Package for the Social Sciences (SPSS) for descriptive, inferential, and correlational statistical analyses of the collected data. The study presents information on the general emotional intelligence levels of undergraduate students of two universities. Similarly, the research study identifies three levels of academic achievement of students: high, average, and low achieving and establishes their correlation with emotional intelligence competencies and levels. Furthermore, the study explores students' emotional intelligence levels differentiated by such independent variables as their age and gender.

Key words: emotional intelligence, academic achievement, higher education, undergraduate students.

Introduction. Academic achievement of students in higher education settings is an integral part of what we expect higher education to achieve. However, today, the soft skills of future specialists are not of small importance as well. Back in 1995, intelligence quotient (IQ) was the preeminent indicator of a person's success in many spheres of life [4]. Nowadays, specialists of modern enterprises and organizations have to obtain full power of their "human potential", which includes such notions as communication, leadership, negotiation and creative skills apart from their "intellectual potential" [5 p.90]. Consequently, the success of a person is not merely restricted to his or her cognitive abilities, but also such a notion as Emotional Intelligence or Emotional Quotient (EQ) has to be considered. Hence, only recently, this notion has been viewed within the educational sphere and particularly in connection with cognitive abilities and IQ (intelligence quotient).

Literature review. There have been several studies in Kazakhstan which explored the emotional intelligence sphere in the context of education. Two studies had been investigated the emotional intelligence concept in connection with social intelligence and academic performance [6], as well as the

effect of emotional intelligence on the meaning-existential potential of students [7]. The first study [6] had been conducted only in one NIS school in Aktobe so that it limited the research frames. The second study [7] selected students from one state university named after K. Zhubanov in Aktobe, which also did not provide the researchers with a room for comparison. Furthermore, there was a theoretical study which examines the relationship between emotional intelligence and teaching competencies in higher education context [8], it mainly was aimed at investigating the implementation of the competency-based approach in the educational system of Kazakhstan. No studies are known to us that explored the relationship between emotional intelligence and academic achievement in two higher education institutions with considerably different backgrounds.

Generally, higher education institutions emphasize the importance of IQ mastering and pay less attention to other types of intelligences, including emotional intelligence. However, such components of emotional intelligence as interpersonal and intrapersonal competencies are considered to be more significant for life success than IQ [9]. The same situation is happening in Kazakhstan, where a contemporary higher education system does not provide due attention to emotional intelligence development [10]. Lack of time management skills when it comes to academic and non-academic matters, inability to cope with multiple assignments from various instructors, and other issues lead many students to excessive pressure and stress. Among all of those struggles, the personal problems such as communication with friends and family, becoming independent, and mastering individual learning habits are the most frequent for students in that period of their life [11]. Additionally, students who are close to graduation may experience the so-called "the job-seeking stress" or "the unemployment stress syndrome" which "…can be defined as the insecurity of college students with regard to the prospect of obtaining future employment" [12, p.150]. Therefore, researchers claim that emotional intelligence components have to be incorporated into higher education institutions' curricula [9].

Conceptual Framework. According to the following researchers: Mayer & Salovey, 1990, Goleman, 1995 and Bar-On, 1997, the models of EI are categorized in certain aspects: ability or performance models by Mayer & Salovey, 1990 competence or trait models by Goleman, 1995, and mixed models [13, p.119]. The emotional competence model by Goleman [14] has been taken as the basis for the next EI theory. Based on those competencies, Nelson and Low [15] developed an education-based approach to emotional intelligence evaluation. This model encompasses four competencies: interpersonal, leadership, self-management, and intrapersonal [15]. This approach has been selected as the conceptual framework (figure 1) of the current study on the reason that it emphasizes the importance of EI in the learning process. Some of EI competencies such as self-management and interpersonal had been endorsed to be predictors of high academic achievement of students [16].

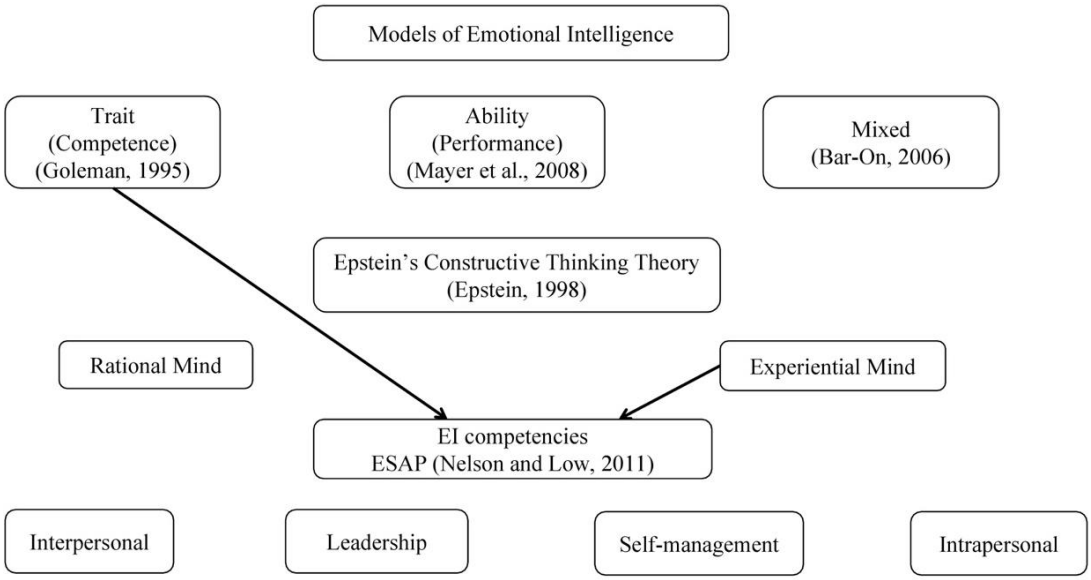

Figure 1 – Conceptual Framework

Apart from Goleman's competency model, Nelson and Low's approach was also based on Epstein's theory of constructive theory. To consider the significance of the emotional intelligence skills and its relation to one's academic abilities, and his or her academic achievement, such theory as "Constructive thinking" should be noted. Epstein [17] in his book "Constructive thinking: The key to Emotional Intelligence" presented the notion of constructive thinking as the ability of an individual to control his or her pessimistic thoughts, what purported to think constructively.

Methodology. Research Questions. The purpose of this study was to identify the relationship between emotional intelligence and academic achievement among undergraduate students. Similarly, other background indicators such as age, gender, year of study, and major were included in the questionnaire. Based on the abovementioned information, the following research questions have been deduced:

RQ1. How do students at the two Kazakhstani universities differ in their EI level?

RQ2: How does EI level differ based on such background characteristics as gender and age?

RQ3. To what extent does student emotional intelligence level correlate with academic achievement levels?

RQ4. To what extent do age and gender impact the relationship between student academic achievement and emotional intelligence?

Research site. The data was collected from two Kazakhstani universities: Autonomous and Regional with the hypothesis that the two considerably different institutions with varying backgrounds, history, student compositions, statuses, and other characteristics would demonstrate different levels of EI skills in relation to their academic success. The investigation of participants from two different institutions allowed us to see a bigger picture of the EI level of undergraduate students. The third reason is the different types of two universities. Autonomous University is considered to be an international high-quality teaching and research institution, which implies stricter demands to student enrollment, including higher grade average point, English language proficiency (IELTS, TOEFL), subject tests, that vary according to departments. Regional University, in its turn, is a multidisciplinary institution, which embodies forty specialties of bachelor's degree, around thirty specialties of master's degree and five specialties of the doctoral degree. Those discrepancies in initial selection criteria may indicate in what ways student EI level and their academic success are interconnected and how the EI skills may be developed.

Sampling strategy. The study participants were selected among undergraduate bachelor students from two Kazakhstani universities: Autonomous and Regional. The sample was recruited on a non-probability basis. Initially, we planned that the sample would consist of around 300 participants with 150 and 150 students from each institution considerably. The exact size of the sample consisted of 239 participants, 98 and 141 undergraduates from two universities (autonomous and regional), respectively. To receive a planned number of responses, we emailed around 500 surveys. Therefore, the response rate was 47 %, since 239 participants out of 500 returned their surveys. The slight distraction from the planned amount of participants has occurred due to some differences in the contingents of bachelor degree specialties where around 2900 students in Autonomous University and about 6000 students in Regional University. Similarly, another reason for the difference in groups' population is a voluntary basis of participation.

To seize the diversity of experiences, the undergraduate students of first, second, third, and fourth years of study have been involved in the research project. In general, the participants picked prewritten categories of answers, for instance, year of the study included: freshman, sophomore, junior and senior responses, specialty: humanities, natural sciences, technology and other. Since GPA varies in two institutions, we included the following range of percentages for respondents' convenience: 92-100, 84-91, 76-83, 68-75, 59-67, 51-58, 50 and lower. Thus, according to those divisions, certain groups have been formed.

Research Instruments. The online survey questionnaire was used as the data collection tool for the study. During the questionnaire construction, the pre-existing survey framework was implemented. Emotional Skills Assessment Process (ESAP) developed by Nelson and Low [15] was used to measure students' emotional skills. The original version incorporated 213 items, which is available on the official web site of Emotional Intelligence Learning Systems. For the current study, we used 63 items ESAP

version, which is embedded in the book "Emotional intelligence: Achieving academic and career excellence" by Nelson and Low [15].

The Emotional Skills Assessment Process is a purposefully modified questionnaire, which measures students' emotional capacity to react in certain situations, which also correlates with their academic skills. Initially, the measurement instrument divides 63 items under 10 emotional skills. The items have been reduced to 34 statements from the original ESAP questionnaire, and six questions were allocated for background information to make the survey more adaptive and flexible. Thus, the abovementioned 10 emotional skills have been divided in the following order: 1) assertion (items 7-11); 2) social awareness (items 12-16); 3) empathy (items 17-19); (4) decision-making (items 20-22); 5) leadership/positive influence (items 23-25); 6) drive strength (items 26-29); 7) time management (items 30-31); 8) commitment ethic (items 32-34); 9) self-esteem (items 35-37); and 10) stress management (items 38-40). The measurement instrument encompasses a 4-point Likert scale, which varies from "strongly disagree" to "strongly agree".

Reliability of the instrument. The reliability analysis of the ESAP four competencies, estimated by Cronbach's Coefficient Alpha, ranged from .41 - .83. The personal leadership competence was endorsed at .83 percent, followed by self-management, interpersonal communication, and intrapersonal development. The reliability coefficient of the intrapersonal competency (.41) appeared to be considerably lower compared to other competencies. However, it can be acceptable considering the previous research studies using the same questionnaire. For instance, in her doctoral dissertation, Ashworth [29] reported the reliability coefficient of intrapersonal competence to be .53.

Academic achievement measurement. At the beginning of the questionnaire, such variables as age, gender, year of study, and major and self-reported academic achievement measurement had been included. Even though a grade average point is a commonly used assessment tool, it may vary considerably from one university to another. Therefore, we indicated the following percentages for participants: 92-100, 84-91, 76-83, 68-75, 59-67, 51-58, 50 and lower, so they might select the most appropriate scale.

Findings. Emotional Intelligence Level of Students at Two Universities. The results of the current study have stated that there is a statistically significant association between emotional intelligence and academic achievement of undergraduate students. This finding is aligned with other previous studies that confirmed the link between emotional intelligence and academic achievement [18,19,6,20,21,22]. The mean score of overall emotional intelligence level as measured by four EI competencies was 2.71, with 2.74 for the Regional University sample and 2.65 for the Autonomous University sample, respectively (figure 2). Therefore, this is an interesting finding, even though there is a slight difference between the two universities in mean scores. Generally, undergraduate students of the Regional University scored higher according to three EI competencies: interpersonal communication (*M*=2.54), personal leadership (*M*=2.82), and self-management (*M*=2.81), and compared to the Autonomous University (table). Thus, the null hypothesis of the current study that the Autonomous University students expose higher EI levels compared to the Regional University students was rejected.

Independent-Samples T-Test for EI Competencies Differentiated by Two Universities

Variable	Regional University	Autonomous University	t (stat)	df	p (two tail)
Total	2.74 (0.29)	2.65 (0.27)	-2.42	237	0.016
Interpersonal communication	2.54 (0.27)	2.48 (0.28)	-1.45	237	0.147
Personal leadership	2.82 (0.42)	2.66 (0.37)	-3.14	237	0.002
Self-management	2.81 (0.44)	2.63 (0.38)	-3.24	237	0.001
Intrapersonal development	2.64 (0.28)	2.83 (049)	3.35	141.223	0.001
P<.05 for Personal leadership, Self-management, Intrapersonal development. P>.05 for Interpersonal communication.					

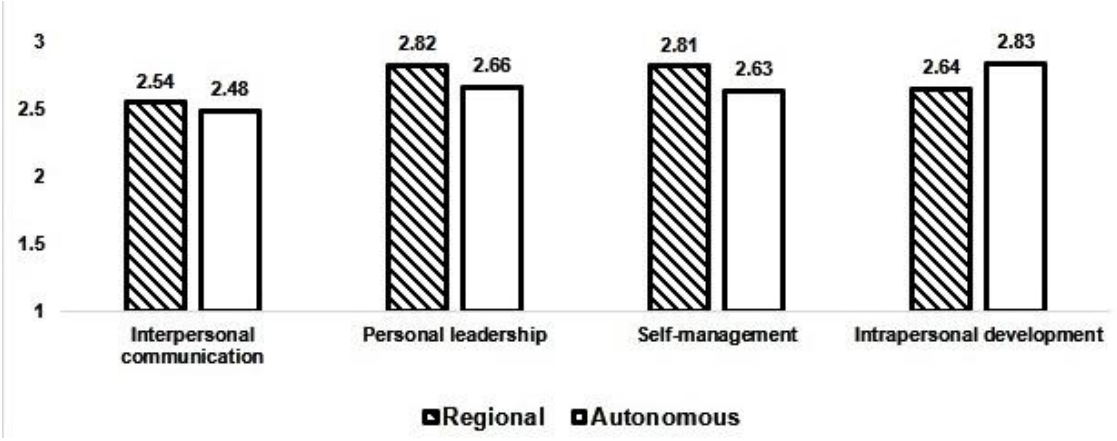

Figure 2 – EI competencies differentiated by two universities

On the other hand, the Autonomous University participants had higher scores on intrapersonal development (*M*=2.83) in comparison to their Regional University counterparts (M=2.64). Therefore, it should be mentioned that students of the Regional University had the highest score on personal leadership (social awareness, empathy, decision making, and positive influence), whereas students of the Autonomous University exposed better intrapersonal development (self-esteem and stress management). Furthermore, two universities differed statistically from each other according to three EI competencies (personal leadership, self-management, and intrapersonal development) except for interpersonal communication.

EI and gender. The outcomes of the current study are also aligned with the previous ones that generally, the emotional intelligence level did not differ statistically according to gender. However, it was remarkable that there was a statistically significant difference in self-management competency by gender. This outcome may imply that male students can differ from female ones based on self-management competency. Furthermore, the results also indicated that male undergraduate students were more self-managed than their female counterparts. Self-management competency includes such skills as drive strength, commitment ethic, and time management. Although, there was no statistically significant difference between the two genders according to the other three competencies, still generally, male students scored higher than their female counterparts on the overall EI level. Consequently, the null hypothesis that female students possess a higher EI level compared to male ones was rejected.

However, the results showed that there was some remarkable score dispersion in EI competencies among male and female students. First, women scored higher on personal leadership (*M*=2.73), and intrapersonal development (*M*=2.71), whereas men had higher scores on self-management (*M*=2.84) and personal leadership (*M*=2.80). According to Nelson and Low [15], personal leadership includes such EI skills as self-awareness, empathy, decision-making, and positive influence. Intrapersonal development embodies self-esteem and stress-management skills. Therefore, it may be deduced that both male and female students reported higher scores on personal leadership compared to other three EI competencies, whereas female participants demonstrated better results in intrapersonal development, while their male counterparts exposed better self-management skills. Those results might not be fully congruent to stereotypically gender traits, where female traits include compassion, nurturance, communion, whereas male characteristics embody assertiveness, competitiveness, agency. [23].

The Association between Academic Achievement and Emotional Intelligence Competencies. A one-way between-groups ANOVA was conducted to identify the effect of participants' academic achievement on their EI level. In other words, if there are differences in EI level of high-, average-, and lower-achieving undergraduate students. The results showed that there was no statistically significant difference between three groups (high-, average- and lower-achieving students) in connection with interpersonal communication ($F(2.236)=0.878$, $p=0.417$) and intrapersonal development ($F(2.236)=0.295$, $p=0.745$) at the $p>.05$. However, the p-value is less than .05 for personal leadership and self-management competencies. There was a significant effect of students' academic achievement on their leadership at the $p<.05$ ($F(2.236) = 4.286$, $p=0.015$). Post Hoc comparisons using the Tukey HSD test identified that the mean score for the high-achieving group (*M*=2.79; *SD*=0.38) was significantly different from the average-

achieving group (*M*=2.58; *SD*=0.43). Remarkably, the mean score for the lower-achieving group (*M*=2.74; *SD*=0.54) was only slightly different than one of the high-achieving group and higher than the average-achieving group.

Similarly, there was a significant effect of the academic achievement of students on self-management competence at p<.05 (F(2.236)=8.039, p=.000). Post Hoc comparisons using the Tukey HSD test indicated that the mean scores for high-achieving (*M*=2.79; *SD*=0.41) group were significantly different than average- (*M*=2.59; *SD*=0.45) and lower-achieving one (*M*=2.45; *SD*=0.40). Consequently, the abovementioned results suggest that high academic achievement may affect personal leadership and self-management more than other competencies. Especially, high-achieving students more likely to expose leadership and self-management skills compared to average- and lower-achieving students. However, according to results, sometimes, academic achievement does not affect leadership skills, so that lower-achieving students may be good leaders as well.

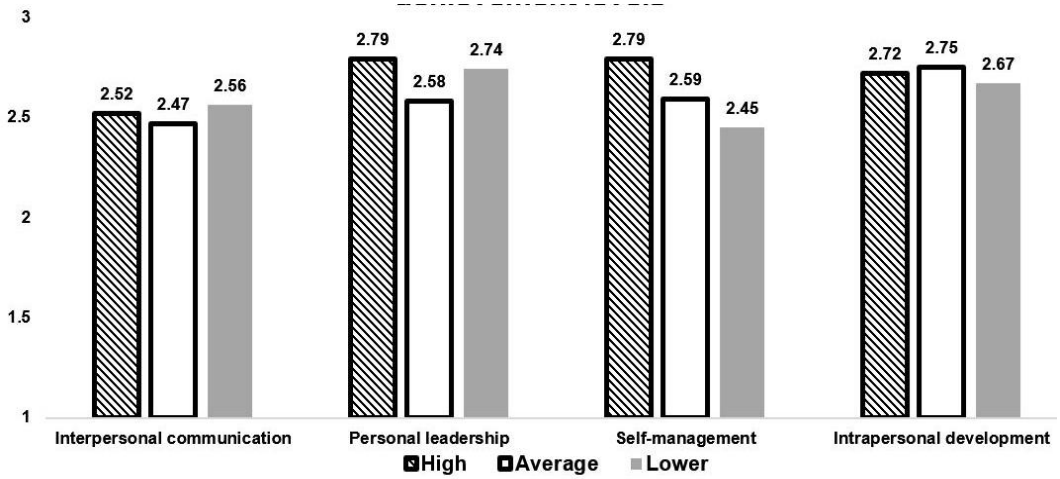

Figure 3 – Between group comparisons of emotional intelligence by academic achievement levels

Conclusion. The primary purpose of this study was to identify the relationship between emotional intelligence and academic achievement among undergraduate students in two Kazakhstani universities. The results of the current study indicated that, in line with the existing scholarship, the overall emotional intelligence levels of students are significantly and positively associated with their academic achievement. The following three EI competencies: self-management, leadership, and intrapersonal, are positively related to academic achievement. Remarkably, we found a negative correlation between interpersonal and academic achievement. These findings signal that high scores on self-management may not always indicate the high academic performance of respondents.

Generally, the regional university scored higher than the autonomous one in the overall EI level. Specifically, the Regional University students had higher scores in three EI competencies: interpersonal, leadership, and self-management, while the Autonomous University students showed higher results on only intrapersonal development. Those results could be explained by the fact that two universities have different backgrounds, discrepancies in grade average points, and overall academic requirements. Thus, it may be deduced that the EI level of students can vary according to the place of study.

Emotional intelligence level does not differ based on gender. The outcomes of the current study have stated that generally, the EI levels of undergraduate students did not differ based on their gender. However, there was a statistically significant difference in self-management competency based on gender. So, male students can differ from female ones based on their self-management competency. Furthermore, we found that male students are more self-managed than their female counterparts. Also, there was a discrepancy between females and males according to the scores of four EI competencies. Generally, young women scored higher on personal leadership, whereas young men showed higher results on self-management.

Generally, student emotional intelligence level correlates with academic achievement levels. The results show that higher-achieving participants demonstrated higher EI levels in comparison to average

students and low-achievers. Remarkably, lower-achieving students scored slightly higher on four EI competencies than average-achieving individuals. Overall, high-achievers exposed better personal leadership and self-management competencies. Average-achieving respondents showed higher scores on intrapersonal development, while lower-achievers demonstrated better personal leadership skills. The previous studies stated that personal leadership and interpersonal competencies could be predictors of high academic achievement [16]. However, the current research has shown that academically lower-achieving students still may demonstrate comparatively high leadership skills. This may mean that the students who are less successful academically, have to be more creative and astute in their personal lives and relationships with peers.

Emotional intelligence among students in Kazakhstan is still largely understudied. This opens up opportunities for further research on the topic. This study was limited to undergraduate students in two universities. Future research would benefit from the inclusion of respondents of different majors, degrees spanning from several higher educational institutions to capture the diversity of the sample. The ESAP (Emotional Skills Assessment Process) was used as an instrument for indicating the EI level of students. However, some statements of the instrument had been omitted what caused a lower reliability percentage of one of the sections. To receive more reliable answers and indicate wider representation of all EI areas, researchers should attempt to employ the full version of the questionnaire.

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ҚАЗАҚСТАНДЫҚ БАКАЛАВРИАТ СТУДЕНТТЕРІНІҢ ЭМОЦИОНАЛДЫ ИНТЕЛЛЕКТІ МЕН АКАДЕМИЯЛЫҚ ҮЛГЕРІМІ АРАСЫНДАҒЫ БАЙЛАНЫС

Аннотация. Жоғары оқу орнындағы студенттердің үлгерімі мен академиялық үлгерімі оқу үдерісінің ажырамас бөлігі болып саналады, сондай-ақ қазіргі уақыттағы «икемді дағдылар» болашақ мамандар үшін де маңызды. XX ғасырдың екінші жартысында «Эмоциялық интеллект» тәуелсіз ұғым болып танылса да, психология, білім беру және басқару саласындағы сарапшылардың көбі бұл саланы бірмәнді деп санайды. Бұрындары эмоционалды интеллект пен академиялық үлгерім арасындағы қарым-қатынас бойынша бірнеше зерттеулер жүргізілген. Алайда Қазақстанда осы саладағы зерттеулер аз жасалған. Сол себепті, жоғары оқу орындары студенттердің оқу барысында жетістіктерге жетуі үшін эмоциялық интеллект элементтерінің маңызды екендігін ескеруі керек. Бұл зерттеу автономдық және аймақтық жоғары оқу орындарындағы студенттер арасында эмоционалды интеллект пен академиялық жетістік арасындағы қарым-қатынасқа бағытталған. Зерттеу нәтижелері Қазақстандағы жоғары білім жүйесіне ықпал етуі мүмкін, себебі әкімшіліктегі маман, менеджер және мұғалімдер екі мекемедегі студенттердің эмоционалдық интеллект деңгейін білуі мүмкін. Сонымен қатар, басқа жоғары оқу орындары осы зерттеу нәтижелерін оқушылардың эмоциялық ақыл-ойының деңгейін арттыру мақсатында өздерінің оқу жоспарларында тиісті іс-әрекеттерді қоса пайдалана алады.

Зерттеуде тоғыспалы корреляциялық дизайн қолданылады [1,2,3]. Зерттеудің мақсаты – студенттер арасында эмоционалды интеллект пен оқу үлгерімі арасындағы өзара байланысты анықтау. Эмоциялық интеллект деңгейін анықтау үшін ESAP (Эмоционалдық дағдыларды бағалау үдерісі) сауалнамасы арқылы деректер жинақталды, сондықтан зерттеу төрт негізгі құзыреттілікті көздейді: тұлғааралыққа, көшбасшылыққа, өзін-өзі басқаруға және адаммен қарым-қатынасқа бағытталған. Студенттердің оқу үлгерімі туралы ақпарат алу үшін студенттердің оқу үлгерімінің шамамен пайыздық мөлшерлемесі пайдаланылды. Бұл деректер Қазақстанның екі жоғары оқу орнынан жиналды. 239 студент таңдап алынды, тиісінше, екі жоғары оқу орнынан (аймақтық және автономды) 141 және 98 студент қатысты. Қатысушылар ерікті қатысудың детерминистік үлгісі негізінде таңдалған. Статистикалық пакет (SPSS) жиналған деректерді статистикалық талдау үшін пайдаланылды. Зерттеу барысында деректерді талдау сипаттаушы, дедуктивтік және корреляциялық статистикалық деректер арқылы жүзеге асты. Зерттеуде екі университеттегі студенттердің эмоционалдық интеллекттерінің жалпы деңгейі туралы ақпарат береді. Сонымен қатар, зерттеу студенттер жетістіктерінің үш деңгейін: жоғары, орташа және төменгі деңгейін көрсетеді және олардың эмоциялық интеллект құзыреттілігіне қатысты екенін көрсетеді. Бұдан басқа, зерттеу жұмыстары қатысушылардың жас ерекшелігіне және жынысына қарай студенттердің эмоциялық интеллект деңгейінің әсерін зерттейді.

Түйін сөздер: эмоциялық интеллект, академиялық үлгерім, жоғары білім, студенттер.

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ВЗАИМОСВЯЗЬ МЕЖДУ ЭМОЦИОНАЛЬНЫМ ИНТЕЛЛЕКТОМ И АКАДЕМИЧЕСКОЙ УСПЕВАЕМОСТЬЮ СРЕДИ СТУДЕНТОВ БАКАЛАВРИАТА В КАЗАХСТАНЕ

Аннотация. Академическая успеваемость и успеваемость студентов в высших учебных заведениях является неотъемлемой частью учебного процесса, однако в настоящее время “гибкие навыки” также важны для будущих специалистов. Хотя эмоциональный интеллект был признан независимым понятием во второй половине двадцатого века, тем не менее, большинство экспертов в области психологии, образования и управления считают эту область довольно неоднозначной. Ранее было проведено несколько исследований, посвященных взаимосвязи между эмоциональным интеллектом и академической успеваемостью. Однако мало исследований в этой области было проведено в Казахстане. Таким образом, вузам необходимо определить значимость элементов эмоционального интеллекта для успеха студентов в процессе обучения. Данное исследование сосредоточено на связи между эмоциональным интеллектом и академическими достижениями среди студентов автономного и регионального университетов. Результаты исследования могут внести вклад в систему высшего образования в Казахстане, поскольку администраторы, менеджеры и преподаватели могут быть осведомлены об уровне эмоционального интеллекта студентов из двух учреждений. Другие высшие учебные заведения могут использовать результаты данного исследования, чтобы повысить уровень эмоционального интеллекта студентов, включив в свои учебные программы, соответствующие мероприятия.

В этом исследовании используется перекрестный корреляционный дизайн [1,2,3]. Целью исследования было выявить взаимосвязь между эмоциональным интеллектом и успеваемостью среди студентов. Чтобы определить уровень эмоционального интеллекта, для сбора данных использовалась анкета ESAP (Процесс Оценки Эмоциональных Навыков), поэтому исследование было сосредоточено на четырех основных компетенциях: межличностные, лидерские, самоуправляющие и внутриличностные. Для получения информации об академической успеваемости студентов использовались примерные процентные баллы студентов. Данные были собраны в двух казахстанских университетах. Выборка участников состояла из 239 студентов, 141 и 98 студентов из двух университетов (регионального и автономного) соответственно. Участники исследования были отобраны на основе детерминированной выборки, по добровольному участию. Статистический пакет (SPSS) был использован для статистического анализа собранных данных. В ходе исследования анализы данных были проведены с помощью описательной, дедуктивной и корреляционной статистики. В исследовании представлена информация об общем уровне эмоционального интеллекта студентов двух университетов. Аналогичным образом, исследование демонстрирует три уровня успеваемости учащихся: высокий, средний и более низкий и их взаимосвязь с компетенциями эмоционального интеллекта. Данное исследование также определяет влияние возраста и пола на уровень эмоционального интеллекта учащихся.

Ключевые слова: эмоциональный интеллект, академическая успеваемость, высшее образование, студенты.

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PSYCHOLOGICAL AND SOCIAL ASPECTS OF INNOVATIONS AND STANDARDIZATION IN EDUCATION

Abstract. The purpose of the research is to analyze the processes of innovation in education in the context of the problems of its standardization and individualization. The research method is a theoretical analysis of the problems of innovation in Russian education in the context of the problems of its standardization and individualization. Modern education has become one of the spheres of traditional business. Corporations and enterprises of different levels actively intervene in educational processes. They trying to optimize management processes at the “initial stage”. The selection of professional, corresponding to a certain organizational culture of personnel goes into the formation of these personnel (starting with the university and ending with the average and primary education). At the same time, individuality and human activity in the world of standards and certifications is less and less time and space: compliance or non-compliance with standards, including management standards, creates a new “queering zone”. These people do not want to live for the sake of serving the interests of financial and industrial corporations and their owners. They are on the verge of total social exclusion. Standardization creates a gap between a person as “unique” individuality, a self-managed and active system and a person as a member of a corporation, a “part” of business, production, a passive “cog” of the system. The standardization of education is an important part of its improvement. However, it should be implemented precisely in the modus of improving a person as an individual, partner and professional. Otherwise, since it is being implemented now, it is aimed at the formation and transformation of a person as a labor "resource" or "capital", more or less demanded by modern economies and businesses, as well as their plans (mondialization and reduction of the planet’s population), it clearly leads to the collapse of universities and schools, education, art and science, that is, culture and humanity as a whole. The standardization of education should include a constant increase in its level in accordance with the development of technologies for training and educating people at all levels of education, in any educational situations. In this context, the individualization of education, there is an increase in the quality of education, the requirements for teachers, students and the process and results of education. The task of society, as well as the state and business, is not to destroy education, but to raise it to new heights, relying on the best achievements, and not rejecting them for the sake of the falsely understood "innovation" and "modernity". Education of the present and the future should integrate the transfer of knowledge and skills (cultural transmission) with the processes of development of a person as a creator: a person as a subject of culture is created by it and creates it.

Key words: business, education, innovation, standardization, individuality, competence approach.

Introduction. Purpose of the study is to analyze the processes of innovation in education in the context of the problems of its standardization and individualization. Modern education has become one of the areas of traditional business (Chaichuk, 2016, Side, 2003). Corporations and enterprises of other levels actively intervene in the processes of education, seeking to optimize management processes at the "initial stage": the selection of professional, corresponding to a certain organizational culture of personnel goes into the formation of these personnel, starting with the university and ending with secondary and primary education. At the same time, the buyer himself who wishes to remain "valid" in the world of corporate requests, chooses the model and form of education that would allow him to integrate into the system "in the best way": the best for the corporation and, in part, for himself. However, the "self" in the world of standardization and certification has less and less space and time: compliance or non-compliance with standards, including management standards, creates a new "queering zone": along with disabled people, LGBT, "counterculture" members and members of the other marginal communities. Standardization creates a gap between a person as "unique" individuality, a self-managed and active system and a person as a member of a corporation, a "part" of business, production, a passive "cog" of the system. This is especially noticeable where management remains as low conceptualized as it was: the strategy of the modern bourgeois and the bureaucrat serving the bourgeois is in momentary unhindered personal enrichment. Imminence denies strategies and concepts: it needs profit. For the sake of profit, everything is for sale. In addition, no matter how optimistic the experts are, trying to see "good in the education of educational documents, the bureaucrat will never put their interests even close to the interests of culture (Kassymova, Stepanova, Stepanova, Menshikov, Gridneva, Arpentieva and Merezhnikov,2018; Kenzhaliyev et al. 2019; Fauzi et al. 2020; Stepanova, Tashcheva, Stepanova, Kassymova, Tokar, Menshikov, and Arpentieva, M.R., 2018).

Materials and Methods. The research method is a theoretical analysis of the problems of innovation in Russian education in the context of the problems of its standardization and individualization.

Considering the modern declarations of innovation in education, one can see that the vast majority of them have destructive meaning. Both "freedom" and "standardization" of education are aimed at one thing. They aim to narrow the range of issues and problems of training and education to a minimum, educate a person deprived of independence and the desire for independence, forced to sell his knowledge and abilities all his life. His aim is to adapt to the world in which He must fight for "a place in the sun" with other people and robots. Here is a big quote: a lot of words about illusory declarations. Then look at the numbers. Therefore, because education becomes a business process, its features change. The basis for the management strategy in traditional education is documents that have a legislative basis. In education as a business process, the creation of a strategy proceeds from the situation of a request for a particular educational service. In traditional education, learning is to acquire existing knowledge. Education in the conditions of the market, however, sets the task to make learning nothing more than the creation of new knowledge, in which the learner receives something for himself personally from what he already knows how to do. In traditional education, the teacher is an "expert" who conveys knowledge to the student. The education system in the market conditions makes the teacher a "mentor-consultant" to help the learner learn to acquire knowledge on their own, thereby organizing his ability to learn through life. In traditional education, teaching is an important element of learning, but in education as a business process, emphasis is placed directly on learning, teaching becomes a learning tool. Traditional education is based on an analysis of causal relationships, i.e. analysis of achievements, with education in market conditions, the direction of learning becomes a foresight. In traditional education, the student's mistake is punished by unsatisfactory marks, in the modern market education system, an error is encouraged as the possibility of finding a new way to solve a particular problem, i.e. encourages the development of creative thinking. In traditional education, the organization of the educational process is strictly disciplined and regulated, in education as a business process; it comes from a learning situation — from a problem. Finally, in traditional education, the management of an educational organization is represented by a vertical of power (a hierarchy) of management that inhibits the development of an organization in market conditions, education as a service requires the use of special business technologies in the management of teambuilding. Command management is the basis of the quality and competitiveness of an organization in the educational market (Chaichuk, 2016, p.120).

Let us leave no comments yet. Somewhere and once imperceptibly, we jumped from business education to business education and for some reason decided that education "should also be oriented to

market processes" (Shpilevaya, Anisimova, 2015, p.195-196). Juggling with words was not just entertainment, but also a very general occupation of the "reforms" of education in the late twentieth and early twenty-first century. In Russia, there is "not a market, but ..." a market dummy, which is a "perverted market economy, some markets do not merge, but exist independently of each other and are organized only in the interests of entrepreneurs" (Aivazov, 2007, p. 4). In parallel, there is not a university education and science, but an education science: that is, models, simulations of both. At the same time, the wealth of culture, the wealth of the world, its secrets lose interest. The interest brings profit. Secrets are interesting as far as they allow maintaining the status quo or increase power, attractiveness, credibility (social and human capital, subject to "conversion" the sale). We also refer to the words of I. Grachev (2007): one of the reasons why knowledge does not turn into a commodity, into innovations, is that the domestic market for the consumption of knowledge in Russia is extremely small. If we estimate as a whole, the innovation market will be very modest - only about $ 10 billion. In order to invest 50–60 billion dollars in this industry (that is, comparable to the primary industries), it is necessary to sell goods by an order of magnitude more - by 500 billion dollars. Even if we rely on a smaller sales volume (within 200 billion), then there are still no such markets inside the country. In addition, for a long time will not be (Aivazov, 2007, p. 13). Yes, and do not need it: there is money, there are slaves, a culture of "moral economics and politics" is creative, and the servile goals of the school and the university, science and innovation are already superfluous. "Educational breakthrough" turns its true face: "educational break. There comes the death (end) of education, and not just the death (end) of the university. We see the ruins of education everywhere in Russia. in global education rankings (UN data), we are now sharing 120th place with Cameroon and Bangladesh (Egorkin,2008, p. 86). The level of education - falls at 4-2.5% (!) Of the level of the USSR in the middle of the twentieth century. The European Union (England) as well as the USA, with which we strive to integrate and which we want to be like, are no better. While professors are transformed into managers, students are transformed into consumers. The merits of science are equal to how much money you can collect for it, and the educated student is now by definition the one who is able to find a job (Eagleton, 2015, p. 23-24). As noted by Yu.P. Saveliev, the main obstacle to modernization (including in innovation) is as follows: "In essence, all amendments to the laws (in the field of education), including those related to autonomous educational institutions, were aimed at total commercialization educational process and the transformation of the education system from the main industry, which is engaged in the state, in the service sector. Thus, education in our country has turned from an object into a subject» (Saveliev, 2007, p.3). Unfortunately, in the modern world, many countries follow this path. "The fact that students often perceive themselves and (or) their parents as consumers is far from misleading, since the modern University is increasingly turning from an ideological tool of the state into a bureaucratic and relatively autonomous consumer-oriented corporation" (Ridings, 2010, p.25). The transformation of education into an "educational service" is a deformation of the essence of university activities. "... Universities and institutes of higher education are now subordinate," writes J.-F. Lyotard - the demand for the formation of competencies, not ideals. The transfer of knowledge does not look more like what is intended to form an elite capable of leading the nation to liberation, but supplies a system of players able to ensure proper fulfillment of the role in practical posts that institutions need» (Lyotard, 1998, p.118).

Results. The propaganda of the "ruins" is based on the rhetoric of "self-realization" and "caring for the person", but in reality, it has nothing to do with them. M. Strong writes "Humanity must begin to treat education as a normal market service ... the point of education is to take a young man and prepare him for life. In no case do not tell him what to do, but simply to give him the skills - including academic ones - that will allow him to be successful, happy and in demand in this century, not in the past, century» (Strong, 2014, p.1). It would seem quite sensible position. The position, which, it turns out, leads us to the beloved American slogan "best in" (the option - "made himself" - best of the world / self-made man): "... To be realized, a person needs to shine in something - not moreover ... a person should understand what comes out best for him and find some demand for his activity» (Strong, 2014, p.1). It turns out that all this "self-realization" is needed only for finding a niche and meeting the demand of other consumers. Nothing else has "value" in value: "beautiful life" is expensive, but if one does not notice the lack of human, cultural meaning of such "self-realization", if one does not notice that propaganda of uniqueness concerns unique situations of people, then one can try to "take from life is everything. " Regardless of what you cannot take, you do not need and do not understand what you take and why. The word "give" (to serve, give, create, is obviously inappropriate here, because it means work and development outside a niche,

outside “brilliance.” However, as O. de Balzac formulated, brilliance accompanies with poverty, and - is carried out in the framework of buying and selling (“brilliance and poverty is the brilliance and poverty of courtesans”) (de Balzac, 1954). A note that “One of the most important skills in the XXIst century is finding new market niches. Every person should be at least a little bit an entrepreneur”, does not correspond at all to the following statement: “Our task is to switch from external motivation and external standards for internal motivation and internal standards” (Strong, 2014, p.1). It is not quite clear how “external brilliance» can become an internal standard: unless as a result of marketing moves well described by the same O. de Balzac and actively developed by transnational corporations. In addition, certainly developed ones are not in order to give, to bestow a thirsty consumer for “brilliance.” However, M. Strong feels very good at the paradox: “Most people who believe in progressive educational methods, they do not believe in a market economy, and most people who believe in markets refuse to admit that fundamentally different, better education systems are possible” (Strong, 2014, p.1), although they cannot explain it. The other side of his own statements explains it: reading and surrounding oneself with people who have knowledge in various fields, is fully capable of replacing the years spent at school, at school and high school. We can learn in different ways, but formalism, including the transformation of education into business and trade, does not solve the problem, but worsens it. You cannot like something in education as a process of relaying culture, but relaying this culture cannot be canceled. In addition, learning from people who know about the world more willing to shine consumer - too. A child without an adult grows up Mowgli. A child in the midst of selling themselves and the world of adults - Jude. The rejection of moral norms, of the prohibitions of cultural prescriptions – the attainment of states of unidentifiable, not reflective as such, meanness and savagery – a phenomenon that we have already noted, is the unaltered attributes of “market” education. In addition, the savagery of meanness, as we see from the “dialogue” improvised by M. Strong and T. Eagleton, does not begin with the students. With teachers. With the administration. With society and the state. Some countries (Sweden, Finland, Holland) understand both the flaws and the merits of universal education and try to make the system more flexible and raise the bar for the culture of relationships at school and the methods of education for education. They get a new miracle. The majority of corporate states around the world monopolized the right to designate the content, form, size, and “cost” of education: reducing education itself to perhaps the “greater minimum”, and paying for it to the maximum (Eagleton, 2015; Strong, 2014]. Describing the “university in ruins”, B. Ridings notes: “The university ... becomes a transnational bureaucratic corporation, either associated with transnational management instances, such as the European Union, or functioning independently by analogy with a transnational company” (Ridings, 2010, p.12). This means the end of the autonomy of the university as a corporation of teachers and students.

The transformation of the university into a corporation for the sale of “educational services” implies a number of consequences (Dolzhenko, 1995, p.13–14). The orientation of the curriculum of education forms towards the tastes of the consumer, the struggle of universities for the market through ratings and advertising campaigns. There is an evaluation of teachers by students, as well as a reduction in the amount of knowledge provided to students in the name of its subsequent additional sale under the sign of "continuing education". There is a reduction of training time, and the imposition of “accounting logic” on it [13], (p. 202, 211). Also there is the struggle of universities for research grants, the main chances in this struggle are quickly highly payable projects etc. (Chaichuk, 2016; Dolzhenko, 1995). This can often be contrasted only with “separate palliative measures” that can slightly delay the final death of a university. Modernist methodology of subjectivist dissection of knowledge and processes of its public broadcasting (“de-differentiation”, “deconstruction”, “schizoanalysis”) maintains the illusion of free spiritual creativity. However, in really it completes the process of decomposition of science and education under the control of transnational capital. The theme of "crisis" and "end" of the university, the problem of university interaction and power (business) this is a problem of the university's loss of the spirit of freedom, changing the essence of the "university idea" as a multiple phenomenon. This is also the problem of mass education as a manifestation of "mass uprising" and the need to form specialists. There are the individuals capable of withstanding the onslaught of the masses (the works of F. Nietzsche, H. Ortega-i-Gasset, M. Weber, E. Durkheim, K. Jaspers, A.N. Whitehead, V. Humboldt, J. Newman, J.-F. Lyotar, B. Ridings (Dolzhenko, 1995; Durkheim, 1991; Lyotard, 1998; Ridings, 2010). In Russia and the world, the ideas of J. Dewey and other scholars who easily replace “service” with “service” are extolled. The danger of this “word games” is illustrated by E. Durkheim, who, not being naive, associated with the development of specialization of education the emergence of new morality, when “everyone will cooperate for the good of

everyone" (Durkheim, 1991; Dolzhenko, 1995 p.378). "New morality" turned out to be old immorality. K. Manheim, using the example of fascism, described the fruits of activity of big and small "leaders": specialization, neutralizing interest in real problems and ways to solve them, and tolerance (objectivity). Insisting on the importance of developing the ability to "shine", society actually contributes to the suppression of consciousness / reflection. "The autonomy of the individual cannot be saved by neglecting the analysis of the social conditions in which a person must live and survive" (Manheim, 1994, p.480).

A.A. Polonnikov compares the educational and educational-professional relationship models. The professional model is holistic, systemic, and complete: paradoxically more coercive than the educational one criticized for coercion, it "traces professional activity structures" (Polonnikov, 2002a, p.169-170; Polonnikov, 2002b; Giroux, 2007). "The formation of the individual in accordance with the professional model ... is directed to the future, is of a project nature." The attitude to the other is expansive, assimilative, disregarding, critical, typical of "self-centeredness, as on the basis of defining a situation." Educational - open, changing and deformalized, the form is absent, "subordinated to the type of the educational task to be solved." It implies "the marginalization of the individual, his transfer to a crisis uncertain situation as a condition for choosing an opportunity ... temporarily irrelevant." The educational attitude is not expansive, dialogical, resonant, distanced and decentralized: "Entering into a dialogue with the text, we generate a new understanding that expands the horizon of our own consciousness. Understanding the new text, we begin to understand ourselves in something new. "Understanding itself, according to H.-X. Gadamer - there is self-understanding in something» (Gadamer, 1998, p.311).

P.G. Schedrovitskiy wrote: "Personal and individual development should not be identified with the ideas of individualized preparation and training. These are completely different ideas and programs ... In the idea of individualized education, a program of targeted and strictly oriented preparation of a person for functional duties in non-educational systems is cumulated; this idea embodies all the tendencies of training specialization caused by the increasing complexity and differentiation of modern technological production" (Schedrovitskiy, 1993, p.14). "The logic of achieving goals is contrasted with the logic of expanding life chances ... Education, unlike training, is aimless, in the sense that it does not focus on any external systems as the source of formation of an order or requirements for the results of training or education" (Schedrovitskiy, 1993, p.133-134). Similarly, he understands the "cares" of the liberals (bourgeois) and M. Scheler: "Education is not "training for something", for a profession, a specialty, for any kind of performance, and even more so education does not exist for such training. On the contrary, any training "for something" exists for education, deprived of any external "goals" - for the most well-formed person» (Scheler, 1992, p.64). At the same time, education leads a person" beyond the limits of what a person directly knows and comprehends. It consists in learning to attach importance to another, to find generalized points of view in order to "perceive the objective in its freedom and without self-serving interests. However, as noted by V.A. Lektorskiy, "you need to be aware that it is a question of "transplanting" some ideas not even from one system to another, but as it were from one world to another. In this other world, ideas begin to live a new life, play a different role and be adopted on completely different grounds" (Lektorskiy, 1999, p.214-215). That is, he is "re-functionalized" (Polonnikov, 2002, p.166).

Discussion. We shell discuss the results and how they can be interpreted in perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may be highlighted.

Consumption as "addictive to feeding" on the part of pupils, and "unfolding on the shelves" of one hundred teachers can distinguish the introjection process from learning (Freire, Giroux, 1985, p.187-188): according to P. Freire, pupils can be "fed" with introjects or, using C. Gergen, "feed" the truth of the experts (2000). This means often "educating" in the reproductive, regressive-repressive model of traditional and modern mass education (Cashdan, 1988). S. Cashdan to describe the processes taking place here formulates a model of transfer relations, including three components: projective identification, meta-communication and affective confrontation. Projective identification, "including a transfer mechanism", is "implicated" on dependence and power (social or mental - authority and reference), as well as sex or other attractiveness (Cashdan, 1988). The pathological "double knot" ("double bond") arises as a dependence on the content of the form of education, as well as a dependence on projective identification (parent-child relations). S. Cashdan describes two ways to overcome transfers - "unleashing a knot": meta-communication and confronting communication (the subject has the ability and the ability to say "No!" When others demonstrate helplessness and induce an opponent's desire to create and maintain

complementary dependency relationships). Meta-communication as a complex procedure requires a teacher of high reflection and accuracy. Confrontation requires the ability to go beyond the established role relationships of experience in understanding situations formed in the course of a long professional activity or participation in social and psychological training programs.). The question is also whether the teacher / interlocutor supports or frustrates whether the student is able to overcome the frustration of mental and other "educational gluttony" without aggression and increasing dependence (new transfers of dependence, power and attractiveness). Option is the transition from authority to the production of authority in the educational process (Friere, Giroux, 1985, p.189-190). Rejection of the demonstration in education of only the final, "parade" product and bringing aspects related to the demonstration of production technology into the immediate context of interaction knowledge (and personal material in the form of demonstration of their strategies and values of work with knowledge, experience). An important idea for understanding these moments is the idea of generative relations: For a constructionist teacher, according to C. Gergen, the main task is participation in generative relations, relations from which the student comes out with broader possibilities of effective assignment. The role of the student changes from the object of operation to the subject of the relationship (Gergen, 2000, p.96). Introjection of students implies filling them with knowledge "canned food". The personal involvement of the participants in the dialogue is important: in the case of "feeding," training makes all participants socio-cultural neurotics, absenteeism and breakdowns, dislike for school, etc. against this background is very healthy. In the case of the transfer of personal histories, confessions of the teacher, conditions are created for development within the framework of complementary teacher-student relationships, similarity, identification relations (Friere, Giroux, 1985, p.191). These relationships lead students to the need to make the process of acquiring knowledge personal for themselves: to expand their capabilities in realizing their attribution to educational reality, to enter into the area of generative relations. An alternative to "feeding" can also be found in detective deductions of "problem-oriented" training, searching for "good forms", experiments, and hypotheses. Alternatively, maybe it was found in the "floods", faith in the wisdom of the world around him, teaching the student to have a world full of meanings, and contact with metastable and pseudo-stable forms and contents. This requires the teacher and the education system as a whole to pay special attention and respect for the student, along with tactics of overcoming competition: "conventional" (alternating) or joint (integrative, looking for the third important, for example, truth). "Life in equivalence" allows overcoming the urges of "educational / intellectual gluttony" and "gluttony of awareness / gestalt", reflection» (J. Enright), etc., to overcome attempts to arrange a performance-competition of "central figures": any arising from the background the figure is self-sufficient and valuable in itself "here and now", like any previous one, and any subsequent one (Friere, Giroux, 1985).

Conclusion. Therefore, it becomes obvious that those who develop education programs, textbooks and "foresight models" should be experienced methodological teachers, and not just people who earn textbooks and education in general. At the same time, they should be able to do this, which will not arise if the society and the state do not reconsider their attitude to education and to each other. The standardization of education is an important part of its improvement. However, it should be implemented precisely in the modus of improving a person as an individual, partner and professional. Otherwise, since it is being implemented now, it is aimed at the formation and transformation of a person as a labor "resource" or "capital", more or less demanded by modern economies and businesses, as well as their plans (mondialization and reduction of the planet's population), it clearly leads to the collapse of universities and schools, education, art and science, that is, culture and humanity as a whole. The standardization of education should include a constant increase in its level in accordance with the development of technologies for training and educating people at all levels of education, in any educational situations. In this context, the individualization of education, there is an increase in the quality of education, the requirements for teachers, students and the process and results of education. The task of society, as well as the state and business, is not to destroy education, but to raise it to new heights, relying on the best achievements, and not rejecting them for the sake of the falsely understood "innovation" and "modernity". Education of the present and the future should integrate the transfer of knowledge and skills with the processes of development of a person as a creator: a person as a subject of culture is created by it and creates it.

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БІЛІМ БЕРУДЕГІ СТАНДАРТТАУ ИННОВАЦИЯСЫНЫҢ ПСИХОЛОГИЯЛЫҚ ЖӘНЕ ӘЛЕУМЕТТІК АСПЕКТІСІ

Аңдатпа. Зерттеу мақсаты – білім берудегі инновациялық үдерістерді стандарттау және даралау мәселелері тұрғысынан талдау. Зерттеу әдісі – орыс тілінде білім берудегі инновация мәселелерін стандарттау және даралау мәселелерін теориялық талдау. Қазіргі білім беру дәстүрлі бизнестің бір саласына айналды. Корпорациялар мен түрлі деңгейдегі кәсіпорындар білім беру үдерістеріне белсенді араласады. Олар басқару үдерістерін «бастапқы сатыда» оңтайландыруға тырысады. Қызметкерлердің белгілі бір ұйымдастырушылық мәдениетіне сәйкес келетін мамандарды іріктеу кадрларды қалыптастыруды қамтиды (университеттен бастап, орта және бастауыш білімге дейін). Сонымен қатар, стандарттар мен сертификаттаудағы жеке адам мен оның іс-әрекеті уақыт пен кеңістікті азайтады: стандарттарға, соның ішінде басқару стандарттарына сәйкес келу немесе сәйкес келмеу жағдайы жаңа «күту аймағын» тудырады. Бұл санаттағы адамдар қаржылық және өндірістік корпорациялар мен иесінің мүддесі үшін қызмет етуді құптамайды. Олар толықтай әлеуметтік шеттетілу жағдайында қалады. Стандарттау адамның бірегей даралық, өзін-өзі басқаратын белсенді жүйе әрі корпорация мүшесі, бизнестің, өндірістің «бөлігі», жүйенің пассивті «бонты» ретінде адам арасындағы алшақтықты тудырады. Білім беруді стандарттауды жетілдірудің маңызды бөлігі саналады. Алайда ол адамды жеке тұлға, серіктес және кәсіпқой ретінде жетілдіру барысында нақты жүзеге асырылуы керек. Әйтпесе, қазіргі уақытта іске асырылып жатқандықтан, бүгінгі заманғы экономика мен бизнес пен жоспары (планета тұрғындарының мондиализациясы мен азаюы) аз талап ететін еңбек «ресурсы» немесе «капиталы» ретінде тұлғаны қалыптастыруға және қайта құруға бағытталған әрі нақты планетарлық өмірге әкеледі. Университеттер мен мектептің, білімнің, өнер мен ғылымның, яғни мәдениет пен тұтас адамзаттың күйреуіне душар етеді. Білім беруді стандарттау білім берудің барлық деңгейінде, кез келген білім беру жағдайында адамдарды оқыту мен тәрбиелеу технологияларының дамуына сәйкес деңгейін үнемі жоғарылатуды қамтуы қажет. Бұл тұрғыда білім беруді даралау – білім сапасының артуы, тәрбиешілерге, студенттерге қойылатын талаптар және білім беру үдерісі мен нәтижесі деген мазмұнды қамтиды. Қоғамның, сондай-ақ мемлекет пен бизнестің міндеті – білімді құлдырату емес, оны жаңа белеске көтеру, ең жақсы жетістіктерге сүйену және шындыққа негізделмеген «инновация» мен «қазіргі заманға» орай қабылдамау болып саналады. Қазіргі және болашақтағы білім беру үдерісі білім мен дағдының берілуін (мәдени трансмиссия) адамның тудырушы ретіндегі даму үдерісімен біріктірілуі қажет, адам мәдениет субъектісі ретінде оны қалыптастырады.

Түйін сөздер: бизнес, білім, инновация, стандарттау, даралық, құзыреттілікке негізделген тәсіл.

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ПСИХОЛОГИЧЕСКИЕ И СОЦИАЛЬНЫЕ АСПЕКТЫ ИННОВАЦИЙ И СТАНДАРТИЗАЦИИ В ОБРАЗОВАНИИ

Аннотация. Целью исследования является анализ инновационных процессов в образовании в контексте проблем его стандартизации и индивидуализации. Метод исследования - теоретический анализ проблем инноваций в российском образовании в контексте проблем его стандартизации и индивидуализации. Современное образование стало одной из сфер традиционного бизнеса. Корпорации и предприятия разных уровней активно вмешиваются в образовательные процессы. Они пытаются оптимизировать процессы управления на «начальном этапе». Подбор специалистов, соответствующих определенной организационной культуре персонала, идет на формирование этих кадров (начиная с вуза и заканчивая средним и начальным образованием). В то же время индивидуальность и человеческая деятельность в мире стандартов и сертификаций все меньше и меньше времени и пространства: соблюдение или несоблюдение стандартов, включая стандарты управления, создает новую «зону ожидания». Эти люди не хотят жить ради служения интересам финансовых и промышленных корпораций и их владельцев. Они находятся на грани полного социального отчуждения. Стандартизация создает разрыв между человеком как «уникальной» индивидуальностью, самоуправляемой и активной системой и человеком как членом корпорации, «частью» бизнеса, производства, пассивным «винтиком» системы. Стандартизация образования является важной частью его совершенствования. Однако она должна быть осуществлена именно в модусе совершенствования человека как личности, партнера и профессионала. В ином случае – так, как она осуществляется сейчас, нацелено на формирование и трансформирование человека как трудового "ресурса" или "капитала", более или менее востребованного современными экономикой и бизнесом, а также их планами (мондиализации и сокращения населения планеты), она однозначно ведет к краху университетов и школ, образования, искусства и науки, то есть культуры и человечества в целом. Стандартизация образования должна включать постоянное повышение его уровня в соответствии с развитием технологий обучения и воспитания человека на всех ступенях образования, в любых образовательных ситуациях. В этом контексте же индивидуализация образования, есть повышение качества образования, требований к обучающим, обучающимся и к процессу и результатам образования. Задача общества, а также государства и бизнеса - не уничтожить образование, а поднять его на новую высоту, опираясь на лучшие достижения, а не отвергая их ради ложно понятой "инновационности" и "современности". Образование современности и будущего должно интегрировать передачу знаний и умений (культурную трансмиссию) с процессами развития человека как творца: человек как субъект культуры создается ею и создает ее.

Ключевые слова: бизнес, образование, инновации, стандартизация, индивидуальность, компетентностный подход.

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PROBLEM OF AGENCY AND AUTHENTICITY OF A PERSON WITH DISABILITIES AND RELATIONSHIPS IN COUNSELLING

Abstract. The purpose of the study is to understand the characteristics and possibilities of psychological counseling as an inclusive practice aimed at helping clients understand their true selves, achieve authenticity, congruence, and transparency (subjectivity or agency). The research method is a theoretical understanding of the features and possibilities of psychological counseling as an inclusive practice aimed at helping clients understand their true selves, achieve authenticity, congruence, and transparency (subjectivity or agency). The "unusualness" of the life and relationships of people with disabilities often and more strongly than people without disabilities encourages them to understand the problems of "true", "true" being. These people more often and more than others know all the difficulties of establishing and developing relations of mutual understanding. Mutual understanding assumes that partners understand themselves, each other and the situation of interaction. Partners can also somehow understand not only the situation of "direct" interaction, but also the situations of life - their own and another person. However, such an understanding is not as simple and easy as the illusion of understanding, which is common among "ordinary" people (without disabilities), says about it. It seems to people that they understand each other, without effort and problems; however, this is far from being the case. Mutual understanding, multi-level and multi-component process, an important condition for the success of inclusive practices. Inclusive practices - educational, socio-psychological and other practices of including people with disabilities in the community: as equal, meaningful, contributing to the social development of people. The possibilities of psychological counseling as an inclusive practice are related to the fact that it should and can be aimed at helping clients understand their true nature, achieve authenticity, congruency and transparency (subjectivity) in the process and as a result of building and developing mutual understanding. The inclusive nature of the consultative dialogue is reflected in the leading ethical and transmodel principles of counseling, such as person-centeredness and acceptance, respect and translation (delegation) of responsibility (to the client as a consultant) and empathy, parity and trust in the client's understanding of himself and the world, specificity (appeal and personalization , objectivity and subjectivity), optimism and focus on the development of the client as an individual, partner and professional. The limitations of counseling as an inclusive practice are connected only with its task of advisory, non-subject-educational support of the formation and development of the client. The specifics of counseling as an inclusive practice is related to the fact that it guides the client and his family, as well as the educational institution, at the same time on 1) the principle of reality and 2) the principle of development ("optimism"). Reality helps to assess the development potential at every moment and in what specific situation in each specific relationship (educational or otherwise). And optimism - focuses on the development of a person as a person, partner and professional in the widest possible range, outside of medical and

everyday stereotypes and stigmatizing forecasts. So a person can become himself, the subject of his life, achieve transparency and authenticity, along with harmony and congruence.

Key words: inclusion, disability, understanding, authenticity, agency, psychological counseling, trans-theoretical approach.

Introduction. The “unusualness” of the life and relationships of people with disabilities often and more strongly than people without disabilities encourages them to understand the problems of “true”, “true” being. These people more often and more than others know all the difficulties of establishing and developing relations of mutual understanding. Mutual understanding assumes that partners understand themselves, each other and the situation of interaction. Partners can also somehow understand not only the situation of "direct" interaction, but also the situations of life - their own and another person. However, such an understanding is not as simple and easy as the illusion of understanding, which is common among "ordinary" people (without disabilities), says about it. It seems to people that they understand each other, without effort and problems; however, this is far from being the case. Mutual understanding, multi-level and multi-component process, an important condition for the success of inclusive practices. Inclusive practices - educational, socio-psychological and other practices of including people with disabilities in the community: as equal, meaningful, contributing to the social development of people.

The problem of subjectivity and authenticity of a human with limited possibilities is an important aspect of educational and professional interaction, in academic and professional psychological counselling (Arpentieva, Kassymova, Lavrinenko, Tyumaseva, Valeeva, Kenzhaliyev, Triyono, Duvalina, Kosov, 2019; Arpentieva, 2015; Kassymova, Stepanova, Stepanova, Menshikov, Arpentieva, Merezhnikov, Kunakovskaya, 2018; Kassymova, Tokar, Tashcheva, Slepukhina, Gridneva, Bazhenova, Shpakovskaya, Arpentieva, 2019; Kassymova, Tyumaseva, Valeeva, Lavrinenko, Arpentieva, Kenzhaliyev, Kosherbayeva, Kosov, Duvalina, 2019; Kassymova, Kosherbayeva, Sangilbayev, Schachl, Cox, 2018; Kassymova, Valeeva, Stepanova, Goroshchenova, Gasanova, Kulakova, Menshikov, Arpentieva, Garbuzova, 2019; Kenzhaliev et al., 2019; Fauzi et al., 2020).

Problem Statement. Subjectivity or agency is the ability of a person to act as an agent (subject) of an action, to be independent of other people. There are many interpretations of this term in terms of the humanistic and humanitarian paradigm). Under the “subjectivity” of A.N. Leontyev understands a certain set of human qualities that characterize the sphere of his activity abilities, his ability to self-determination as creative, adaptive activity, etc. (Leontyev, 2009). The most accurate analogue in foreign psychology is the word "agency". It denotes a person’s ability to be an agent (subject), that is, an active actor, a driving force of action. The most accurate analogue in foreign psychology is the word "agency". It denotes a person’s ability to be an agent (subject), that is, an active actor, a driving force of action. Often, “agency” is “a realized opportunity for people to influence their inner and outer world, and not just to know it. To attribute this property to the inner or outer world (its parts) of one or another personal or intersubjective (social) significance. This ability is the power inherent in people to act purposefully and meaningfully (reflexively), being among themselves in more or less complex relationships. By building and developing relationships (as well as completing and destroying them), people correct and remake the world in which they live. They do this by reflecting on the past, present and future from different points of view, based on their own ideas about the desirable and undesirable, attainable and inaccessible. For subjectivity, the qualities of autonomy (self-government, autonomy) and the equality of a person to himself (transparency, authenticity and congruence) are important (Inden, 2000). Under this is because his behavior (actions and acts) and relations (interactions and attitudes) are not fully determined by the conditions of his immediate environment. Full subject (agent), according to R. Harre, V.A. Petrovskiy, K. Rogers, G. Beitson, and other researchers are able to distance themselves both from the influence of the environment and from those principles on which the behavior was based up to the present moment. A person is a perfect subject in relation to a certain category of actions, if both the tendency to act and the tendency to refrain from action are in his power (Harre, 1979: 246; Rogers, 2003). According to S. L. Rubinstein, subjectivity is considered as a person’s ability to make changes in the world and in itself. This ability is formed in the course of historical and individual development (Suvorova, 2011). Agency is the capacity of an actor to act in a given and modified environment. The subject in this case is characterized by such qualities as activity and ability to develop and integrate self-determination and self-movement (self-improvement).

Subjectivity also implies conscious (co)creative activity, the ability to reflect and the awareness of one's own uniqueness, understanding and acceptance of oneself and another person (Markus, Kitayama, 2003:5).

Subjectivity is the leading quality of a consultant who is able to help clients and other people to become themselves, subjects. Psychological counseling and psychotherapy are inclusive practices in which people with disabilities come into inclusive contact with a specialist. The consultant psychologist acts as an ideal model of an "inclusive" attitude to oneself and the world: it is authentic and congruent, it is included in meaningful social relationships and develops them, and it is effective for itself and for society and helps to become socially effective and self-efficient to other people, including people with disabilities. A consultant psychologist is a specialist who has passed and continues to undergo vocational training or retraining, supervision or co-vision. These practices of training and retraining (advanced training and personal development) are aimed at the formation and development of his ability to live in peace and harmony with himself and the world. He acts as a guide, a mediator. This guide supports the movement of the person, including the person with HIA, to himself, to the authenticity of his relationship with himself and the world, and to inclusion. He broadcasts to the client the responsibility and importance of sharing, cooperation and mutual assistance with other people, no less than the importance of self-realization, self-help and the accumulation of resources. Unfortunately, this aspect of inclusive culture and the consideration of counseling as the practice of inclusion is practically undeveloped: many studies are limited to considering inclusive educational practices (correlating and comparing strengths and weaknesses, developing models of general integrative and special education). The practice of psychological-pedagogical and psychological counseling, which is obvious in its inclusiveness, usually remains outside the field of attention of researchers. At the same time, the psychologist, as an ideal representative of an inclusive community, can open the way to solving many issues that other inclusive practices confront, which are limited to pedagogical or even "technical" aspects of inclusive activity. Psychological counseling as a practice and theory of helping a person to become himself, partners and a professional (Rogers, 1973; Maslow, 2014).) is an important object of study how to improve inclusion, as well as specific assistance to specific people in the direction of realizing their potential and overcoming barriers and limitations in HIA development and its consequences (from primary and secondary defects to stigmatization and self-stigmatization).

Research Questions. The leading question of the study is the question of which direction the consultant is moving and moving the client. A consultant as a "double agent" works in the interests of the client and in the interests of the community. Since in many cases it is directly connected with state and professional structures and associations, it also works as an "agent" of the state. The fact that the goals of these "agent networks" are significantly different is an obvious fact. In addition, an ordinary specialist, as a rule, should choose a network that he considers the most significant. Historically, unlike pedagogical and social practices (where specialists help people, primarily in the interests of the state and society), psychologists provide assistance without becoming attached to the needs of the social. Their task is to protect, support on the path of self-recognition, self-inquiry, self-transformation, self-realization of the person himself. The psychologist relies on the inner essence, more or less mature and successful defenses and substitute-compensating ideas, experiences, patterns of behavior, etc. of the client. Therefore, he helps the client to achieve a state of self-efficacy, and already based on self-efficacy (Bandura, 1997) a road to social efficiency is built. The first is considered as a condition of the second, and not vice versa (as in other inclusive practices). The psychologist can "sacrifice" harmony and support the client in a similar time sacrifice in order to achieve "truth", including transparency, the compliance of a person at all levels and in all aspects of his being with his inner essence.

Purpose of the Study. The purpose of the study is to understand the characteristics and possibilities of psychological counseling as an inclusive practice aimed at helping clients understand their true selves, achieve authenticity, congruence, and transparency (subjectivity or agency).

Research Methods. The research method is a theoretical understanding of the features and possibilities of psychological counseling as an inclusive practice aimed at helping clients understand their true selves, achieve authenticity, congruence, and transparency (subjectivity or agency).

Findings. The main goal of the consultant is to help the client to stop needing external support and achieve independence and self-support. For this, the consultant himself must be a non-discriminatory, holistic, mature person. Such a consultant can offer a client a mature, non-positive, developing relationship. As a representative of a cognitive-behavioural school, A. Lazarus, wrote, "The choice of

relationships is no less important during psychotherapy than the choice of technique" (Lazarus, 1993: 404). He considered it important to "tailor" attitudes to the characteristics of the individual and the needs of specific clients, as well as to the client's needs regarding counselling. To do this, the consultant needs to be flexible, versatile and holistic "an authentic chameleon" (Kwee, Lazarus, 1986; Dryden, 1991; Lazarus, 1993). As U. Dryden noted, describing the dialogue with A. Lazarus, "Effectively working consultants are switching from one method to another, using all of them alternately…. In the spirit of a chameleon" (Dryden, 1991: 19). In order to adapt to the client, several tactics can be used, for example,

1) "applying the relationship continuum" from "very close ties and dependencies on one end to rather formal, practical involvement — on the other" (Kwee, Lazarus, 1986: 333);

2) use of styles that allow the consultant to meet the needs of clients ("cold / warm", moderate / bright, agreeing / confronting, "your boyfriend" / specialist, self-revealing / mysterious, sensitive feeling, soft / "army sergeant", etc.) (Lazarus, 1993: 405);

3) measuring the ability to provide support and give instructions (supportive / detached and prescriptive / non-directive) and predict the success of assistance (clients ready for a high level of directivity and a high degree of support and consultants who provide and demonstrate such high levels are most successful);

4) use of relationships based on certain techniques related to the school and causing the transformation of the relationship between the client and the consultant (Lazarus, 1989c);

5) bridge building is a technique for improving mutual understanding, illustrating the flexibility of consultants as "multimodal", using various methods, specialists, suggesting that consultants first tune in to customer preferences and then direct clients to more productive options (Lazarus, 1989a, 1992).

That is, consultants first "speak the language of their clients" or "start moving from the place where clients are located", and later moving on to less developed by the client's interaction methods, which serves to prevent many barriers, blockades and resistances in their work. The principle of professional capabilities and limitations is also important: "Know your own limitations and the strengths of other specialists" (Dryden, 1991: 30). A. Lazarus also noted that many specialists adhere to artificial boundaries, prescriptions and prohibitions that block their ability to help themselves and others. Some very reputable experts call for the strictest observance of moral and other frameworks of counselling, but "if I believed this, I could no longer be an effective therapist; their warnings would have made me climb into a clinical straitjacket that would interfere with my judgment and block the ability to really help people coming to me" he wrote. On the contrary, the self-disclosure required for the client and the consultant, the ability to change the time and place of the meeting, its duration and other conditions, meet with the client outside the consulting room, a sliding payment scale could develop mutual understanding (rapport), as well as perform useful developmental and corrective functions. He refers to P. London (London, 1964, p.14-15): "Either therapists can successfully influence behaviour or cannot, or in saying that one way or another, they have little choice. If they want to say that they cannot do this... in areas where people are most interested, and therefore they are not at all responsible for the behaviour of their clients, you need to ask what right they have to work" (p.14-15). Of course, many moral and ethical standards and boundaries are needed, but sometimes they work as destructive bans, reducing clinical effectiveness and productivity (Lazarus, 1994). Therefore, a significant part of the norms and boundaries can and should be violated "for the common good". If too strictly observe all norms and not change the boundaries, you can get the most negative consequences.

In the humanistic model, relationship-oriented interventions are at the centre of a number of principles or meta-technologies (Rogers, 1957, 1972, 1973; Biermann-Ratjen, Eckert & Schwartz, 1995; Bommert, 1987; Tausch & Tausch, 1990):

1) reflection of feelings and empathic understanding (reflecting feelings, accurate empathic understanding, accurate empathy), suggesting the reflection of what was said by the client and verbalization of the content of experience, trying to put it into words and develop (deepen and expand) the unconscious components of the experience as something that seems clear, resonant and important specialist (Sachse, 1992);

2) human warmth or unconditional positive acceptance (transparency, unconditional positive regard, warmth) as a condition for self-disclosure of a client, his self-expansion in a state of psychological safety;

3) authenticity or congruence (genuineness, congruence, realness, authenticity), the sincerity of the consultant and his involvement in the dialogue with the client.

We studied - theoretically and empirically - and other principles, techniques and success factors of psychotherapy and counselling, which can be understood as an extension of the empathic response:

4) activity as internal participation or self-disclosure and personal involvement (Minsel, Langer, Peters & Tausch, 1973), (Schwartz, Eckert, Babel & Langer, 1978) (Truax, Fine, Moravec & Willis, 1968);

5) concretization and differentiation and generalization as the specification and integration of meaningful content (Truax & Carkhuff, 1964), (Minsel, 1974) (Schwarz, 1975 Wexler, 1974).

6) adjustment and confrontation and alternative understanding / attitude / behavior (Bommert, 1987; Tscheulin, 1990, 1992).

The confrontation assumes that the specialist makes comments whose essence is different from the client's opinion about himself and the world, he points out to him inconsistencies in the feelings and ideas, values and actions of the client and significant for his people, etc. The purpose of the confrontation is to redirect the client's attention on phenomena that were not accessible to him, not clear, did not like to comprehend them and change their attitude to them and context. At the same time, confrontation can deepen and expand the experience / performance, fulfilling the educational or didactic function, the function of ending (stopping) or encouraging (for example, Sachse, 1996). In a wider context, confrontation follows the general rule of successful psychotherapy: "unusual" behaviour patterns, relationships and understanding what happening consultant is.

Empirical studies suggest that client design changes are more likely if the psychotherapist to a high degree implements all the basic variables identified above (for example, Tausch, 1973). The implementation of the principles of sincerity and congruence, respect and acceptance, reflection and empathy, concreteness and integrativeness, activity and inclusiveness, confrontation and adjustment of the consultant in relations with the client, in general, contributes to a higher quality, versatile and multi-level self-exploration of the client. Self-expansion, in turn, leads to effective and constructive transformations, including by reducing the incongruence, the inconsistency of man to himself. Self-expansion is a complex process and result that integrates into itself. According to H.J. Schwarz (Biermann-Ratjen, Eckert & Schwarz, 1995) indicators of the intensity of interaction with oneself, closeness in relation to one's own feelings and ideas, rejecting or accepting a position in relation to them (Perret, Bauman, 2012 p.561).

R. Sachse (Sachse, 1992) believes that it is necessary to narrow the idea of self-exploration (self-understanding) as criteria for consulting success: it is not understanding in itself, but an understanding method (strategy) that reflects the depth of the processing of semantic information about the client and the world. Accordingly, it is also important not the understanding by the client's consultant, but the processing proposed by the specialist: the client's understanding strategy. In our studies (Arpentieva, 2017, Minigalieva 2012), it was also shown that the leading criterion, which largely reflects the success of counselling or psychotherapy, is precisely the client and the counsellor who understands himself and each other. Of great importance are strategies or "levels of understanding", including non-professional (daily and monological), professional (monological and professional), and super-professional (dialogical).

Different ways of understanding the client are aimed at different sides of his subjectivity. As for the productive subjectivity (productive agency), in general, for changes to occur, including as D. Schwartz writes, for a collaboration to occur, people are not obliged to communicate: even if they speak different languages, they can work together successfully (Schwartz, 1999). In addition, the motivation for collaboration arises to the extent that they can show their subjectivity through participation in productive activities. Therefore, in many cases, including unprofessional "counselling" in everyday life, in the process of joint activities not related to counselling (participation, volunteering, etc.), there are effects of activation of human subjectivity. Even if the communication is not aimed directly at the development of authenticity and other properties, joint activities serve their development. In the context of a disjointed agency (disjoint agency), as noted by H. R. Markus and S. Kitayama, personal autonomy, localized in the individual, his understanding of the meaning of life and other meanings, as well as life practices typical for contexts, comes first (Markus, Kitayama, 2003: 5). Life of people with and without disabilities. Complementing everyday life with the practice of psychotherapy or counselling significantly broadens the person's conceptual horizons, and thus helps him to become himself. The united subjectivity (conjoint agency) brings to the fore the relationship of individual subjects. Formation of subjectivity in this model is based on the assimilation of certain cultural models in a dialogue with "significant other" people (consultants, relatives, friends, employees).

Conclusion. The consultant can use understanding strategies aimed at achieving customer congruence, solving problems and injuries associated with the deformation of social and interpersonal relationships, an abundance of social masks and barriers of social interaction. In this context, he acts more like a social worker or social pedagogue whose central tasks are the tasks of increasing the social efficiency of clients and their (re) adaptation to the society ("explaining" strategies).

The consultant can also use understanding strategies aimed at achieving authenticity and the client's self-sufficiency, at least in the context of the ideas that the consultant translates as a supporter of a particular psychotherapeutic school ("interpretation" strategy). He acts largely in the interests of the client, but in general, he is also interested in the "harmonious" individual, who does not create "unnecessary problems" for the society and the state.

The consultant can also direct the client's attention to a state of transparency that allows conscious and cognizable disharmony, if they help a person to achieve a true understanding of his own essence, to realize himself in cooperation, confrontation, dialogue with other people ("dialogical strategies). The moments for the client and the consultant are the moments of self-realization, which determine one or another way of realization in society and the state. The internal reference point is the client himself, of his own choice and in dialogue with selected significant others realizes its potential and its essential purpose.

It is important that different ways of counselling, including different ways of understanding by the client of a consultant, in different ways are addressed to his subjectivity. They have various potential activating a client with a disability. The dialogue forms of understanding (mutual understanding, dialogization) have the maximum potential for activating the client's subjectivity. Monological forms of understanding ("explanations", daily interpretation) have the least potential. Partly activates the client with disabilities ways of understanding, based on professional psychotherapeutic theories and myths of psychotherapy and counselling.

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ПСИХОЛОГИЯЛЫҚ КЕҢЕС БЕРУДЕ МҮМКІНДІГІ ШЕКТЕУЛІ АДАММЕН ҚАРЫМ-ҚАТЫНАСТЫҢ СУБЪЕКТИВТІЛІГІ МЕН ШЫНАЙЫЛЫҚ МӘСЕЛЕСІ

Аннотация. Инклюзивті практика адамдардың әлеуметтік және жеке дамуына ықпал етеді. Оған мүмкіндігі шектеулі жандарды қоғамға қосу үшін білім беру, әлеуметтік-психологиялық және басқа тәжірибелер, яғни өзара түсіністік қатынас орнататын тең құқылы, маңызды, шынайы және белсенді субъектілер кіреді. Зерттеудің мақсаты – психологиялық кеңес беру ерекшелігі мен мүмкіндігін клиенттерге өзінің шынайы табиғатын түсінуге, шынайылыққа, келісім мен ашықтыққа (субъективтілікке) қол жеткізуге, өзара түсінушілікті қалыптастыру және дамыту арқылы қол жеткізуге бағытталған. Зерттеу әдісі – психологиялық кеңес беру ерекшеліктері мен мүмкіндіктеріне теориялық талдау жасау әрі клиенттерге мәнін түсінуге, үдеріске қол жеткізуге және шынайылықты, келісім мен ашықтықты (субъективтілік) өзара түсінісу нәтижесіне көмектесуге бағытталған. Өзара түсінісу – бұл көп деңгейлі және көпкомпонентті үдеріс, инклюзивті тәжірибенің нәтижелі болуының маңызды шарты. Өзара түсінісу серіктестердің өзін, бір-бірін және өзара әрекеттесу жағдайын түсінетіндігін білдіреді. Алайда көбіне түсінісу қиынға соғады, өйткені оған адамдар арасында кең таралған (мүмкіндігі шектеулі емес) түсіну елесі кедергі келтіреді. Бұл түсінуге жалғандық пен күнделікті қарым-қатынасқа тән жеке қасиеттердің жетіспеушілігінен туындайды. Мүмкіндігі

шектеулі адамдардың «ерекше» және өзгеше өмірі мен қарым-қатынасы «шынайы», субъективті болмыстың мәселелерін түсінуге итермелейді. Бұл адамдар басқаларға қарағанда жиі өзара түсіністік қатынасын құру және дамыту қиындығы мен қажеттілігін түсінеді. Инклюзивті практика ретінде психологиялық кеңес берудің мүмкіндіктері клиенттерге шынайы табиғатын түсінуіне, шынайылыққа, келісім мен ашықтыққа (субъективтілікке) қол жеткізуге және өзара түсіністік қалыптастыру мен дамыту нәтижесінде қол жеткізуге септігін тигізуі қажет. Консультациялық сұхбаттың инклюзивті сипаты кеңес берудің жетекші этикалық және трансмодельдік қағидатында көрініс табады, мысалы, жауапкершілік – адамды қабылдау, сыйлау және жауапкершілікті (кеңесші ретінде клиентке) беру және жанашырлық, парития, клиенттің өзін әрі әлемді түсінуіне, ерекшелігіне (тартымдылығы және даралау, объективтілік және субъективтілік), оптимизм және клиенттің жеке, серіктес және кәсіби дамуына бағытталған. Инклюзивті тәжірибе ретінде кеңес берудің шегі клиенттің қалыптасуы мен дамуын консультативтік, пәндік емес білім беру қызметімен байланысты. Инклюзивті тәжірибе ретінде кеңес берудің ерекшелігі оның клиент пен жанұясын, сонымен бірге оқу орнын бір уақытта 1) шындық қағидасына; 2) даму қағидасына («оптимизм») бағыттайтындығына байланысты. Шындық даму әлеуетін әр сәтте және әрбір нақты қарым-қатынастағы (білім беру немесе басқаша) қандай жағдайда болатынын бағалауға көмектеседі. Ал оптимизм – адамның жеке тұлға, серіктес және кәсіпқой ретінде дамуына медициналық және күнделікті стереотиптер мен стигматизациялық болжамнан тыс жоғары деңгейге бағытталған. Осылайша адам жеке тұлға әрі өмірінің субъектісі бола алады, үйлесімділік, өзара келісіммен қатар, ашықтық пен нақтылыққа қол жеткізеді.

Түйін сөздер: инклюзия, мүгедектік, өзара түсіністік, субъективтілік, шынайылық, психологиялық кеңес беру, транстеоретикалық тәсіл.

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ПРОБЛЕМА СУБЪЕКТНОСТИ И ПОДЛИННОСТИ ЧЕЛОВЕКА С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ И ОТНОШЕНИЯ В ПСИХОЛОГИЧЕСКОМ КОНСУЛЬТИРОВАНИИ

Аннотация. Инклюзивные практики способствуют социальному и личностному развитию людей. Они включают образовательные, социально-психологические и другие практики включения людей с ограниченными возможностями в общество: как равных, значимых, искренних и активных субъектов, строящих отношения взаимопонимания. Цель исследования – выявить особенности и возможности психологического консультирования как инклюзивной практики, направленной на то, чтобы помочь клиентам понять свою истинную сущность, достичь подлинности, конгруэнтности и прозрачности (субъектности) в процессе и результате построения и развития взаимопонимания. Метод исследования - теоретический анализ особенностей и возможностей психологического консультирования как инклюзивной практики, направленной на то, чтобы помочь клиентам понять свою сущность, достичь в процессе и результате взаимопонимания подлинности, согласованности и прозрачности (субъектности). Взаимопонимание - многоуровневый и многокомпонентный процесс, важное условие успеха инклюзивных практик. Взаимопонимание предполагает, что партнеры понимают себя, друг друга и ситуацию взаимодействия. Однако чаще всего понимание затруднено: ему мешает иллюзия понимания, которая распространена среди людей (без ОВЗ). Она возникает потому, что пониманию мешают свойственные обыденному взаимодействию фиктивность и бессубъектность. «Необыденность» и необычность жизни и взаимоотношений людей с ОВЗ сами по себе побуждают их понимать проблемы «истинного», субъектного бытия. Эти люди чаще и чаще других осознают трудности установления и развития отношений взаимопонимания, а также его необходимость для своего развития.

Возможности психологического консультирования как инклюзивной практики связаны с тем, что она должна и может быть направлена на то, чтобы помочь клиентам понять свою истинную сущность, достичь подлинности, конгруэнтности и прозрачности (субъектности) в процессе и результате построения и развития взаимопонимания. Инклюзивный характер консультативного диалога отражен в ведущих этических и трансмодельных принципах консультирования, таких как человек-центрированность и принятие, уважение и трансляция (делегирование) ответственности (клиенту консультантом) и эмпатия, паритетность и доверие к пониманию клиентом себя и мира, конкретность (обращенность и персонализированность, предметность и субъектность), оптимизм и нацеленность на развитие клиента как личности, партнера и профессионала. Ограничения консультирования как инклюзивной практики связаны лишь с его задачей именно консультативного, не предметно-образовательного сопровождения становления и развития клиента. Специфика консультирования как инклюзивной практики связана с тем, что оно ориентирует клиента и его семью, а также образовательное учреждение одновременно на 1) принцип реальности и 2) принцип развития ("оптимизма"). Реальность помогает оценить потенциал развития в каждый момент, в каждой конкретной ситуации, в каждых конкретных отношениях (образовательных и иных). А оптимизм - ориентирует на развитие человека как личности, партнера и профессионала в самых широких пределах, вне медицинских и повседневных стереотипов и стигматизирующих прогнозов. Так человек может становиться самим собой, субъектом своей жизни, достигать транспарентности и аутентичности, наряду с гармоничностью и конгруэнтностью.

Ключевые слова: инклюзия, инвалидность, взаимопонимание, субъектность, истинность, психологическое консультирование, трансгеоретический подход.

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THE HIGHER EDUCATION ADAPTABILITY TO THE DIGITAL ECONOMY

Absract. Digitalization processes are global and performed in all spheres of economic activities. The development of the digital economy correlates with the dynamics of educational, scientific and technical, and innovative activities in the country. Higher education particularly affects the development of the digital economy because it is a system training highly qualified personnel, conducting quality research, and generating innovations. The **purpose** of the article is the identification of promising vectors of higher education system development under the conditions of digitalization of national economy. *Section 1* of the article presents the authors' methodological approach to assessment the impact of educational, research, and innovation components on digital economy development. The implementation of the authors' approach covers the phased use of methods of statistical, index, cluster and system analysis. The influence of higher education on the structural components of the digital economy (educational, research, innovative ones) is grounded. The **result** of the study was the identification of main trends in the development of higher education under the conditions of digital economy. The problems of the development of higher education are systematized in the groups: contextual, legal, organizational and economic, financial, logistical problems, and problems of internationalization. Based on the results of the analysis, the authors conclude the necessity of development of a conceptual base for increasing the digital adaptability of the higher education system to new socio-economic conditions. *Section 2* of the article describes the concept of the digital adaptability strategy of the higher education system. The concept was developed on the base of structural and functional, systemic and synergetic, and institutional approaches. The proposed concept is based on the idea of deepening the long-term partnership of universities with stakeholders within the Quadruple Helix model. In the **conclusion** section, the authors highlight the key priorities of the digital adaptability strategy of the higher education system.

Key words: higher education, digital economy, adaptability, Quadruple Helix Concept, strategy, university.

Introduction. Digitalization is one of the main trends of social and economic development of leading countries. It increases the role of higher education as a knowledge-generating system that trains highly qualified personnel for needs of national economy, conducts high-quality research, and initiates innovative projects. Achieving positive synergy effects from the higher education institutions' activities requires the establishment of long-term cooperation with a wide range of stakeholders from different sectors: government, business enterprise sector, civil society (within the Quadruple Helix Model). In this context, it is growing the scientific and practical interest to assessment of interaction between these stakeholders under the conditions of digital economy. Moreover, it is becoming urgent to identify the main components of digital economy development, and to research the universities' contribution to their dynamics.

Brief literature review on digitalization of economy. Bell D. (1999), Castells M. (2000), and Masuda J. (1983) formulated the methodological basis for the study of information society. F. Machlup (1962), and Porat M. (1977) created the fundament of research of information (digital) economy. Shkarlet et al. (2017) and [16] Vdovenko et al. (2019) disclosed the basic descriptors of the national economy digitalization. Andriessen D. (2004), Schuller T. (2007), and Kalenyuk I. et al. (2020) studied the role of education and intellectual capital in the economic growth. The influence of science and knowledge in countries' socio-economic development was analyzed in research papers of Bekkers R. (2008), and Brenner Th. (2015). Some scholars (Kwiek, 2008; Oakeshott, 2003-2004) substantiated the contribution of higher education institutions in the development of society. Kasatkin et al. (2019) highlighted the aspects of modern universities impact on the formation of the digital wave of Kondratiev's long cycles. Cosmulese et al. (2019), and Donald E. Hanna (2019) identified the peculiarities of the development of education in the conditions of digitalization of society and national economy. Patsiorkovskiy et al. (2019) described the regional aspects of development of education in conditions of digital society. Tran et al. (2020) characterized the national specific of digitalization of educational system.

Brief literature review on Quadruple Helix Concept development. The methodological background of the Quadruple Helix Concept was made by Etzkowitz H. (2008) and Leydesdorff L. (2012), who have described the relationships of stakeholders with the framework of Triple Helix ("government – universities – industry"). The merit of Carayannis E., Campbell D. and Grigoroudis E. (2009; 2012; 2016) was the complement of Triple Helix Model with the fourth element – the civil society. Woo Park H. (2014) supported and developed the scientific and applied aspects of the Quadruple Helix Concept. Oscar A. et al. (2010) and Colapinto C. et al. (2012) disclosed the specific of using of Quadruple Helix Concept in issues of innovation development. Peshkova G. and Samarina A. (2018) highlighted the features of cooperation between universities and business in the conditions of digital economy. At the same time, the problem of identification of prospects of the higher education institutions integration into partnership within the Quadruple Helix Concept needs in-depth research in the context of national economy digitalization.

The **purpose** of the article is the identification of promising vectors of higher education system development under the conditions of digitalization of national economy. The achievement of the purpose requires a comprehensive approach to the analysis of effects of cooperation of stakeholders within the Quadruple Helix Concept. Such approach could be realized based on analysis of a set of indicators that characterize the results of universities educational, research, and innovation activities. In the conditions of digital economy development, it is becoming urgent to estimate the level of compliance of quantitative parameters and professional structure of universities graduates to the new needs of the real sector of economy. The analysis of the parameters of universities' research activity allows assessing the practical value of the R&D results, prospects of their commercialization, and adequacy to the needs of the business, government, and civil society on the stage of digitalization.

The hypotheses of research:

H1 – the higher education and the digital economy develop interconnected;

H2 – the development of the digital economy determines by three components: educational, research, innovative ones;

H3 – the higher education contributes to the dynamics of all three components of the digital economy;

H4 – the development of higher education under the conditions of digital economy requires the synchronization of the interests of universities, business, government and civil society (within the Quadruple Helix Concept);

H5 – the digital adaptability strategy of the higher education system could be developed based on the Quadruple Helix Concept.

Methods and materials. Conducting the research, we developed the authors' methodological approach to assessment the impact of educational, research, and innovation components on digital economy development. Constructing the approach, we have taken into consideration the following aspects:

- consider the current social-economical tendencies, and trends of scientific-technical development;
- comprise the set of official open-accessed statistical data;
- divide parameters into three groups according to educational, research, and innovation components;
- the higher education contributes the development of educational, research, and innovation components of digital economy;
- thorough analysis of identified parameters.

The developed methodological approach to assessment the impact of educational, research, and innovation components on digital economy development includes three blocks – table 1. Developing the methodological approach, we focus on the fact that higher education affects the dynamics of each of the three structural components of the digital economy:

- educational component - universities provide training and retraining of personnel, forming their ability to think in innovative way, as well as their ICT-skills;
- research component - universities conduct fundamental and applied research, generating new knowledge, inventions, as well as commercialize the R&D results in industry;
- innovative component - universities implement innovative projects, develop innovations, as well as transfer them to the national economy.

Table 1 – Methods of assessment the impact of educational, research, and innovation components on digital economy development

Block	Method	Characteristics	Results
1	method of statistical analysis	allowed to estimate the initial level of readiness of the higher education system for development in the conditions of the digital economy	Identified trends in Ukraine: reduction in the number of higher education institutions; decrease in the number of students; reducing expenditures on higher education in terms of aggregate government spending; reducing the share of higher education expenditure in the total GDP (Fig. 1)
2	index analysis method	revealed the trend of development of the digital economy, within which the educational, research and innovation indices were distinguished	The digital economy in Ukraine is at the stage of formation. Trends in the development of the national higher education system are correlated with the dynamics of the educational index. It confirms the necessity of the development of measures to ensure the adaptability of the higher education system to the conditions of digitalization.
3	clustering method	allowed to deepen the results obtained in the previous stages by conducting a meso-economic analysis on the educational, research and innovation components of the digital economy (on the base of K-means algorithm)	The existence of regional imbalances in the development of digital economy in Ukraine. Conclusion about the necessity of differentiated approach to identification of the higher education system potential in activation of digitalization processes at the mesoeconomic level, (taking into consideration the fact that the results of higher education institutions activities are reflected in educational, research, and innovation components of digital economy.

At the same time, the digital economy determines the transformation of the higher education system. To ensure competitiveness in the new socio-economic conditions, universities should be ready for digitalization and adaptation to external changes (both at the level of the national economy and at the level of the global scientific and educational area).

The stages of proposed methodical approach are described in table 2. The algorithm of presented in this article methodical approach allow:

- to identify the level of digital economy development;
- to specify the features of educational, innovation, and research component of the digital economy development;
- to identify problems;
- to develop the recommendations for activating the contribution of higher education into the development of digital economy in the country.

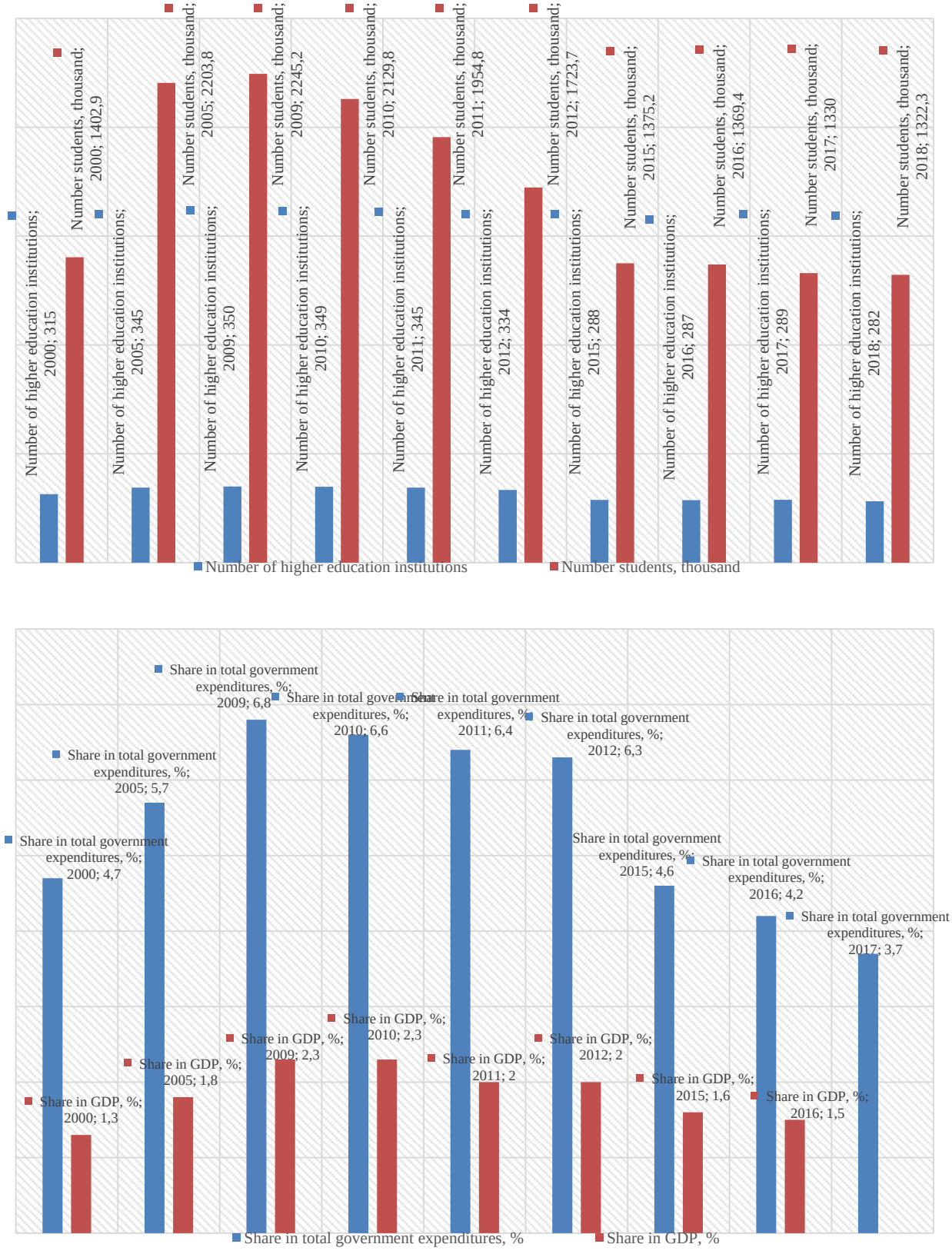


Figure 1 – Parameters of development of national higher education system of Ukraine

Table 2 – Methods of assessment the impact of educational, research, and innovation components on digital economy development

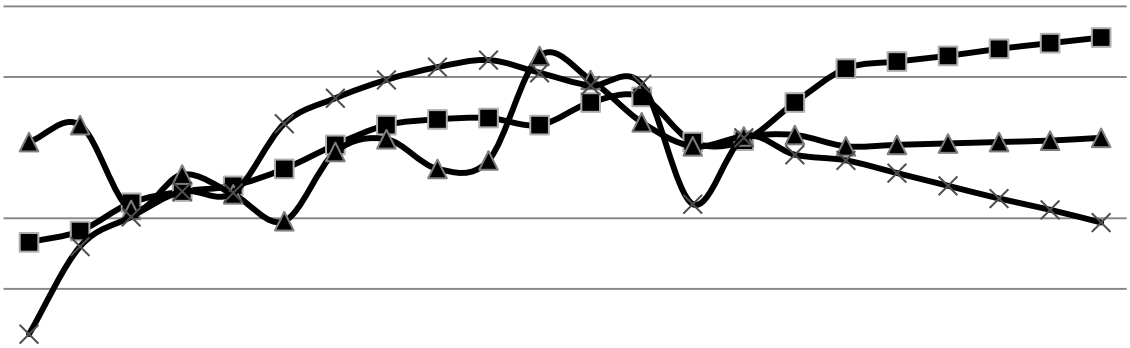
Stage	Characteristics
structuration of the comprehensive integral indicator	educational component, innovation component, and research components
identification of the system of partial indicators	for the characteristics of comprehensive index' components: - educational component – indicators characterizing the staffing potential of the digital economy development (number and structure of higher education institutions; number of undergraduate students, postgraduate students, doctoral students; funding of higher education); - innovation component – indicators characterizing the innovative development of national economy as the basis for its digitalization (introduction of innovative products and new technological processes; expenditures on innovation activity; applications for patenting inventions; agreements on intellectual property rights disposal; share of innovative active enterprises); - research component – indicators characterizing personnel and financial maintenance of scientific and technological development as a basis of the digital economy formation (number of research organizations; number of scientists; R&D expenditures; share of higher education institutions in processes of R&D implementation and financing);
choice of method for constructing a comprehensive indicator	multiplication method, sum method or geometric mean method
accumulation of statistical data array on identified partial indicators	in dynamics - to ensure the reliability of evaluation
determining the weight of each partial indicator within the components	– compiling a matrix of pairwise comparisons - for constructing a hierarchy of indicators according to the degree of influence on the components of comprehensive integral index; – compiling of calculation tables - for determining weight coefficients
formalization and normalization of analytical indicators	compiling of a matrix of standardized values
calculation of components indices	in terms of dynamics of three components. Calculation of forecast values of partial indices of the comprehensive indicator

Results. *Approbation of methodological approach to assessment the impact of educational, research, and innovation components on digital economy development*

The implementation of the first block of methodological approach to assessment the impact of educational, research, and innovation components on digital economy development as exemplified by Ukraine made it possible to come to the following conclusions. The national higher education system demonstrated a low level of adaptation to the current challenges of digital economy. The negative tendencies in the development of this system are caused by the following reasons: the state policy of optimizing of higher education institutions' structure; demographic and migration problems; low level of global competitiveness of domestic universities; reduction of state funding of higher education; low diversification of financial sources of universities.

The results of calculation within the second block of the authors' methodological approach are presented in figure 2. The index of innovation component *(Iinn)* demonstrates the fluctuations, and high elasticity to the transformations of external factors. Its dynamic correlates with the parameters of research activities *(Isc).* During the index analysis, it was forecasted the downward dynamics of educational component *(Iedu).* The mentioned tendency could negatively effect on digitalization of national economy, so it is important to identify the measures of effective realization of the higher education institutions' potential.

The analysis at the second stage allowed making the conclusions about the significant influence of higher education system on digital economy development. This conclusion could be explain with the fact that modern higher education institutions consolidate an intellectual capital of the country; they generate knowledge, innovations, inventions; and also train a new generation of entrepreneurs and professionals for national economy. The analysis identified some problem points, particularly the undeveloped cooperation of universities and business; inefficiency of public financing of higher education; outdated technical base of universities; "brain drain"; low parameters of commercialization of R&D results, etc.



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Isc	-0,67	-0,59	-0,39	-0,31	-0,27	-0,15	0,02	0,16	0,2	0,21	0,16	0,32	0,36	0,04	0,05	0,32	0,56	0,61	0,65	0,7	0,74	0,78
Iinn	0,04	0,16	-0,44	-0,19	-0,33	-0,52	-0,03	0,06	-0,15	-0,09	0,65	0,48	0,18	0,01	0,08	0,09	0,01	0,02	0,03	0,04	0,05	0,07
Iedu	-1,32	-0,7	-0,49	-0,31	-0,32	0,17	0,35	0,48	0,57	0,62	0,53	0,44	0,45	-0,4	0,07	-0,05	-0,09	-0,18	-0,27	-0,36	-0,44	-0,53

Figure 2 – Results of index analysis

The third block of the methodological approach cover the cluster analysis that allow deepening of results obtained on previous stages. The clustering divided the country's regions into groups in appliance with the development levels of educational, research, and innovation components of digital economy. The results showed that the educational component is promising in intensifying the digital economy in Ukraine. The effective realization of the higher education institutions' potential requires the state support of modernization processes in accordance with the challenges of digital economy, and the strengthening of cooperation of universities, enterprises, government and civil society within the Quadruple Helix Concept. Such partnership could solve the financial problems of higher educational institutions, because it allows commercialization of universities' R&D results; promotes the transformation of universities into the regional centers of innovations able to attract the best talents, and investment from diversified financing sources.

Summarizing the result of approbation of three blocks of authors' methodological approach to assessment the impact of components on digital economy development, we identified the system problems of higher education development in the conditions of digitalization of national economy:

- contextual problems – irrelevance or inconsistency of the educational and research processes to the needs of business enterprise sector, government and/or civil society;
- legal problems – inconsistency of the current legislation regarding the commercialization of intellectual property; low level of protection of intellectual property rights;
- organizational and economic problems – underdevelopment of mechanisms for commercial transfer of R&D results;
- financial problems – low diversification of funding sources; low level of universities' financial autonomy;
- logistical problems – outdated equipment of teaching and research laboratories; low development level of innovation and information infrastructure;
- problems of coherence – lack of effective motivational mechanisms for cooperation of economic entities in fields of higher education, science, innovation;
- problems of internationalization – weak competitive position of the national higher education institutions in the global area.

The problems of the higher education system development cannot be fully solved within the existing concept, because it does not take into account the dichotomous nature of the influence of the higher education and the digital economy. Within our research, we focus on the relevance of development of the digital adaptability of higher education that requires the formation of relevant strategy.

Concept of digital adaptability strategy of the higher education system. The development of the concept of digital adaptability strategy of the higher education system is caused by the following reasons: the need to modernize the national higher education system; updating of the integrated financing model within the Quadruple Helix concept ("government sector – higher education sector – business enterprise sector – civil society"); maximizing the positive synergistic effects of stakeholder interaction based on their function and target consent; ensuring the impulse response of the higher education system to the influence of exogenous and endogenous factors; raising the level of resilience, the system's ability to

withstand the external influences, and return to the desired trajectory of development after the impact of the challenges generated by digitalization of the national economy.

The study is based on the following methodological approaches:

- structural and functional approach – used in the analysis of the influence of the global educational area on the interactions between elements of the higher education system;

- systematic approach - in analyzing the essence of the higher education system and its modernization processes in order to ensure its digital adaptability to the challenges and perturbations brought by the digital economy;

- synergistic approach - to develop the mechanisms for effective interaction between the subjects of higher education sector, governance sector, business enterprise sector and civil society in order to minimize the effects of negative synergy and maximize the effects of positive synergy, which are able to ensure the resilient development of the higher education system in the conditions of national economy digitalization;

- institutional approach - to develop a theoretical basis for building a dense business environment within the national economy, based on function and target consent of the Quadruple Helix model entities. Such a business environment should be able to adequately respond to the challenges of the digital economy and to create the preconditions for ensuring the high resilience of economic agents.

The described conceptual approaches are used in developing the concept of digital adaptability strategy of the higher education system (figure 3).

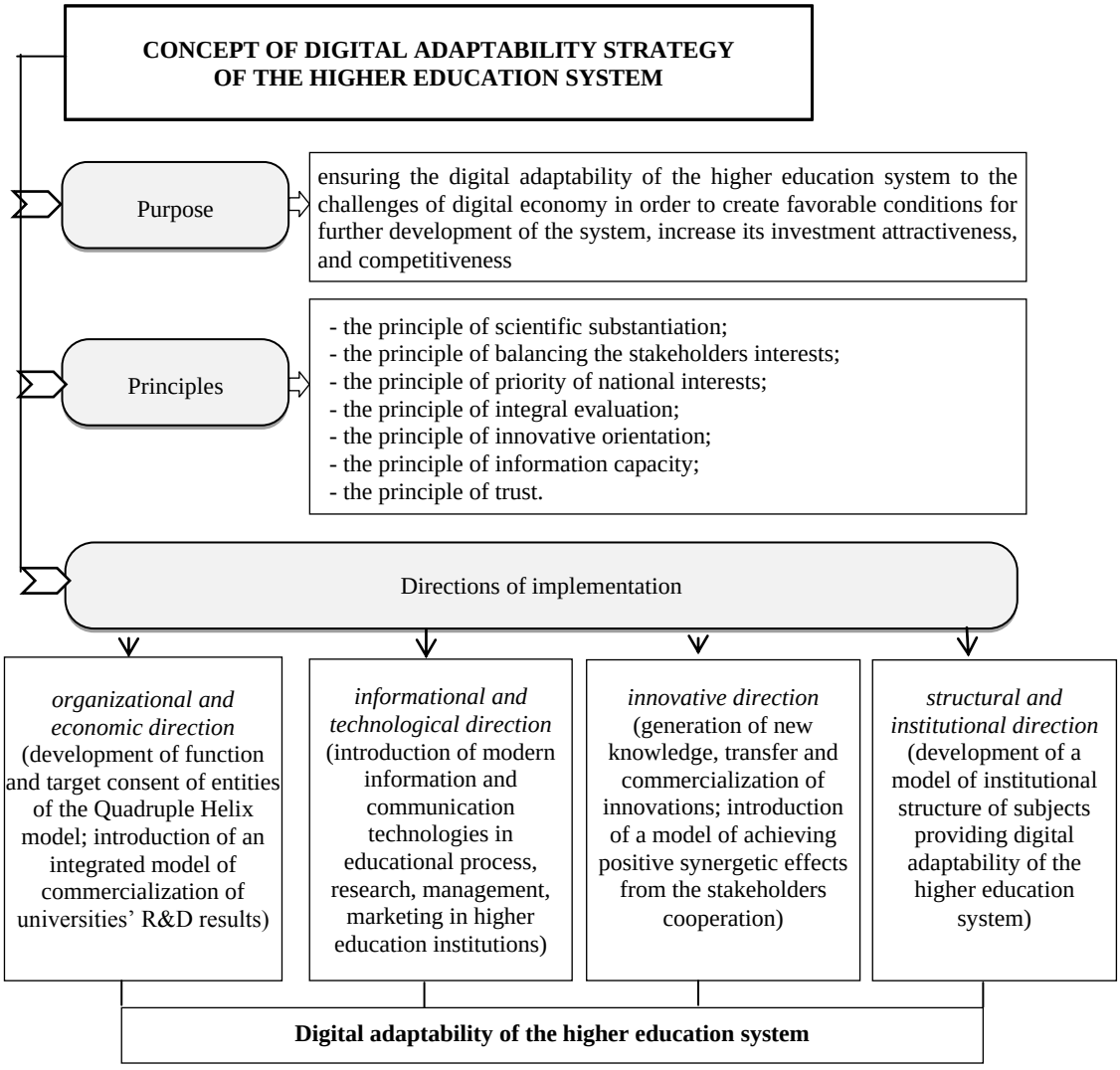


Figure 3 – Conceptual scheme of the digital adaptability strategy of the higher education system

The concept structurally contains the following components:

1) systemic-synergistic (a set of connection between stakeholders that could generate synergetic effects);

2) regulatory (a set of institutions - state, public, international, etc. - in the fields of higher education and science);

3) structural and functional (a set of functions and tasks oriented towards the achievement of the defined strategic goals);

4) informational and communicational (a set of technologies that allow to establish and develop communication channels between stakeholders).

The subjects of the proposed Strategy are: the state and its bodies; higher education institutions and their management (the manage subsystem). The objects are: universities, institutes, academies, their staff and activities (the managed subsystem).

The priorities and expected results of the Strategy should be consistent with the strategic and tactical goals of the state policy in the fields of higher education, scientific, technical and innovative development of the national economy. The implementation of the proposed Strategy is based on the establishment of long-term interaction of its main stakeholders (table 3).

Table 3 – Quadruple Helix entities synchronization matrix
for the implementation of the digital adaptability strategy of the higher education system

	Governance sector	*Business enterprise sector*	*Higher education sector*	*Private non-profit sector* *Civil society*
Governance sector	National interests	Fiscal stimulation of stakeholders cooperation	State orders	Equal access to quality educational services
Business enterprise sector	Taxation	Competition	Investment	Meeting the needs for goods and services
Higher education sector	Transfer and commercialization of R&D results	Skilled personnel; R&D results	Quality educational services	Meeting the needs for quality educational services
Private non-profit sector *Civil society*	Taxation	Needs, interests	Public monitoring	Development of information society

Presented in table 3 matrix contains the results of systematization of perspective directions of synergetic partnership of subjects of the Quadruple Helix model. It is important to emphasize that the entities in the Table 3 in the rows are mentioned as subjects (it means they act and influence), and in the columns are listed as objects (it means they are influenced by the subjects). At the intersection in the matrix are identified the priority vectors of entities cooperation under the conditions of digitalization of the economy.

The basis for the development Strategy (figure 3) is the system-synergetic paradigm and theoretical results of generalizing scientific approaches to the study of the phenomenon of digital adaptability. In addition, current trends in the development of the national higher education system and exogenous factors of influence have been taken into account. The exogenous factors are the factors caused by the transformations of the global educational area that change the very nature and scale of the interaction of subjects. Internationalization and globalization factors need to be taken into account in the Strategy because they create additional risks for domestic universities. Increasing demographic difficulties are leading to a decrease in the student population in EU countries. In such circumstances, foreign education institutions are constantly searching for new markets. The Ukrainian domestic educational services market is attractive for foreign universities. The openness of the Ukrainian market causes the new challenges to higher education institutions of the country. In addition to mentioned above, there is a steady upward trend in the demand of Ukrainian students for foreign universities' educational services.

Therefore, the purpose of the proposed Strategy is to ensure digital adaptability of the national higher education system to the challenges generated by the processes of digitalization of economy in order to

create favorable conditions for further development of the system, increase its investment attractiveness, level of competitiveness and sustainability. The objectives of the Strategy in accordance with the defined purpose are the following:

- synchronization of interests by Quadruple Helix model entities;
- coordination of stakeholders activities;
- stimulating the private investment into the higher education system; activation of commercialization processes;
- promoting the effectiveness of international research and educational projects;
- ensuring the competitiveness of domestic higher education institutions;
- increasing the level of adequacy of educational and research activities of universities to the needs of the real sector of economy in the conditions of its digitalization;
- development of innovative infrastructure at higher education institutions, etc.

The key priorities of the digital adaptability strategy of the higher education system are the following:

1) harmonization with the priorities of the state innovation, scientific, educational policies, as well as harmonization with international programs in the fields of higher education and science;

2) encourage cooperation between the entities of the Quadruple Helix model in educational and research activities;

3) ensuring the effectiveness of the higher education financing model (with accent on diversification of financing sources, differentiation of universities services, expanding the universities financial autonomy);

4) activation of international scientific and educational cooperation of universities in response to the requirements of globalization and internationalization of the educational area;

5) increase of efficiency of universities' educational activity (indicator - level of competitiveness of graduates in the labor market), research (volumes of commercialization of patented inventions and developments), innovative (indicators of transfer of generated innovations to the real sector of economy) and international activity (number of joint research and educational projects);

6) accelerating the pace of implementation of modern information and communication technologies;

7) guaranteeing the effective functioning of the intellectual property protection system;

8) introduction of effective motivational mechanisms for the development of cooperation between higher education institutions and the business enterprise sector.

The implementation of digital adaptability strategy of the higher education system involves strengthening the responsibility of stakeholders:

- at the national level - parliament, government, specialized ministries and departments;
- at the meso-level - public organizations in the fields of higher education and science; employers' associations; business associations, etc.;
- at the local level - management, administrative and scientific-pedagogical staff of higher education institutions (table 4).

Table 4 – Levels of implementation of the digital adaptability strategy of the higher education system

Characteristics of regulation directions at different levels	Possible consequences of effective implementation of measures within the strategy
Macro level – Organization, regulation of modernization processes and the order of their implementation; resource provision; monitoring efficiency of use of resources	Formation at the national level of preconditions for the implementation of modernization changes in the higher education system; enhancing the competitiveness of the national higher education system; synchronization of development of subjects of the higher education system and business enterprise sector
Meso-level – Mobilization of resources and potentials of stakeholders; attraction of external resources for implementation of the Strategy	Reconciling the interests of stakeholders; ensuring the effective use of their potential
Micro level - Encouraging higher education institutions, scientific and pedagogical staff to support modernization changes in the system	Increasing the flexibility of higher education institutions and their management; development of their endogenous environment; increase of international competitiveness of domestic universities at the global educational services market

The joint effective activity of the subjects at the described above levels is possible on the basis of development of mutual trust. In the condition of digitalization of national economy such partnership requires the implementation of effective communication channels, providing high flexibility of information networks, rapid replenishment of information bases, guaranteeing wide and free access of stakeholders to information resources.

Discussion. The concept of digital adaptability strategy of the higher education system presented in the article is focused on increasing the competitiveness of the national higher education system. In this context, it correlates with the research results of Mok K.H. (2015) and Donald E. Hanna (2019). Developing the concept, we paid special attention to identifying promising directions for improvement of both educational policy (Vaughan & Walker, 2012) and approaches to the management of educational systems (Marchenko & Sydorenko, 2019). We agree with the findings of Kassymova et al. (2019) regarding the importance of the strategic planning of the innovative development of higher education, since this is an uncontested way of development within the highly-competitive global scientific and educational area under the conditions of digitalization and internationalization of higher education (Kim, 2016). Therefore we highlighted the innovative direction of implementation of the digital adaptability strategy of the higher education system.

Prospects for further research are the identification of effective tools to increase the impact of digital higher education on sustainable development. This issue has been partially investigated by Giesenbauer B. and Müller-Christ G. (2020), but only at the microeconomic level (at the level of higher education institutions). At the same time, the relevance of this research question requires its in-depth study at the macroeconomic level (at the level of national higher education systems).

Conclusion. Therefore, in our opinion, ensuring the digital adaptability of the higher education system in the medium and long term is impossible without establishing effective synergetic cooperation of domestic universities with enterprises, state authorities, and public organizations. Taking into account the imbalance of activities of the subjects of different sectors of the national economy, their non-synchronization with the higher education sector, the attention of scientists is concentrated on issues of development and implementation of effective motivational mechanisms and appropriate tools for promoting partnership. Achieving synergies from the interaction of Quadruple Helix model entities requires reconciling their interests (coherence principles), pooling resources and potentials (consolidation principle), and coordinating activities (based on trust and information capacity).

The implementation of digital adaptability strategy of the higher education system contributes to the convergence of education, science and business; ensures diversification of funding sources for higher education institutions; enhances the investment attractiveness of education and science; provides for increased international competitiveness of the national higher education system. The digital adaptability of the higher education system will ensure its sustainability in dynamic exogenous conditions, the ability to restore the desired trajectory of development after shock perturbations, to reorganize or adapt to the conditions of digitalization of the national economy.

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ЖОҒАРЫ БІЛІМ БЕРУДІҢ ЦИФРЛЫҚ ЭКОНОМИКА ЖАҒДАЙЫНА БЕЙІМДІЛІГІ

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АДАПТИВНОСТЬ ВЫСШЕГО ОБРАЗОВАНИЯ К УСЛОВИЯМ ЦИФРОВОЙ ЭКОНОМИКИ

Аннотация. Процессы диджитализации являются глобальными и проявляются во всех сферах хозяйственной деятельности экономических субъектов. Развитие цифровой экономики коррелирует с динамикой образовательной, научно-технической и инновационной деятельности в стране. Особенное влияние на развитие цифровой экономики осуществляет высшее образование как система, осуществляющая подготовку высококвалифицированных кадров, проведение качественных исследований и генерацию инноваций. Целью исследования является выявление перспективных направлений развития системы высшего образования в условиях цифровизации национальной экономики. В Секции 1 статьи представлен авторский методический подход к оценке влияния образовательной, исследовательской и инновационной компонент на развитие цифровой экономики. Реализация авторского подхода предусматривает поэтапное использование методов статистического, индексного, кластерного и системного анализа. Доказано влияние высшего образования на выделенные структурные компоненты цифровой экономики (образовательную, исследовательскую, инновационную). Результатом исследования стало определение ключевых тенденций развития системы высшего образования в условиях цифровой экономики. Проблемы развития высшего образования систематизированы в такие группы: контекстуальные, правовые, организационно-экономические, финансовые, логистические проблемы и проблемы интернационализации. На основании результатов проведенного анализа авторы приходят к выводу целесообразности формирования концептуальной базы повышения цифровой адаптивности системы высшего образования к новым социально-экономическим условиям.

В Секции 2 охарактеризована концепция стратегии адаптации национальной системы высшего образования к вызовам цифровой экономики. Разработка концепции реализована с использованием структурно-функционального, системно-синергетического и институционального подходов. В основу предлагаемой концепции авторами положена идея углубления долгосрочного партнерства университетов со стейкхолдерами по модели Quadruple Helix. В выводах авторами выделены ключевые приоритеты имплементации стратегии адаптивности системы высшего образования к условиям цифровой экономики, в частности: гармонизация с приоритетами государственной инновационной, научной, образовательной политики; стимулирование образовательного и научно-технического сотрудничества субъектов модели Quadruple Helix; внедрение эффективной модели финансирования высшего образования; активизация международного научно-образовательного сотрудничества вузов; ускорение темпов внедрения современных информационных и коммуникационных технологий; обеспечение эффективного функционирования системы защиты прав интеллектуальной собственности; активизация процессов коммерциализации результатов научных исследований.

Ключевые слова: высшее образование, цифровая экономика, адаптивность, концепция Quadruple Helix, стратегия, университет.

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RESEARCH ON THE DEVELOPMENT AND IMPLEMENTATION OF AUGMENTED REALITY TECHNOLOGIES IN THE EDUCATIONAL PROCESS

Abstract. The article deals with the development of augmented reality applications on the Vuforia platform, as well as the use of augmented reality technology in the educational process for the purpose of visual modeling of educational material to Supplement the material with visual information. The results of the analysis of existing approaches to the development of augmented reality applications, platforms, tool development environments such as Vuforia, with the ability to connect Unity, and the implementation of augmented reality technology are shown. The importance of using high-level augmented reality technologies, the prospects for using augmented reality technology, and the opportunities and advantages of using it in the educational process are highlighted. It is noted that the situation in the field of education determines the relevance of the use of new information technologies in the field of education and one of the promising areas of development of innovative educational technologies is the use of augmented reality in the learning process. An augmented reality application to great Kazakh poet Abay Kunanbayev's poems created on the basis of marker technology is proposed.

Key words: augmented reality, AR technology, Vuforia platform, marker, recognition, interactive technology, digital educational technologies, educational process.

Introduction. Augmented reality technology in the educational space has been used relatively recently. Today, education is considered one of the most promising areas for the development and implementation of augmented reality technologies. The idea of using augmented reality for learning purposes is quite new, and AR technologies have recently been used in history, geography, and literature classes [1].

Augmented reality is a term that refers to various options for embedding imaginary, virtual objects in a human-visible, real-world space. Additional information can be in the form of text, images, video, sound, and three-dimensional objects. Playback of some processes using augmented reality allows you to visualize the process in real dimensions and capabilities. The principle of technology in a broad sense lies in changing a person's view of the real world using computer technology. In this case, it is possible to use all his senses. In a narrower sense, it is adding new objects to the video image in real time. The author considers augmented reality as " the answer of modern technologies to the problematic issues that arise every day. It is more understandable to most people, it is easier to implement than virtual worlds. Augmented reality allows us to make everyday reality richer. Combined with the inexhaustibility of Internet resources, its possibilities are limitless" [3].

Many experts call augmented reality «improved», «extended», and even «additional». The name «augmented reality» will still be more accurate, since this technology can both complement the surrounding world with objects of the virtual world, and eliminate objects from it. To further clarify, we can define augmented reality (AR) as «an environment with direct or indirect addition of digital data to the

physical world in real time using computer devices – tablets, smartphones and innovative gadgets, as well as software for them».

Methods and Technologies. The author developed an augmented reality for the works of the great Kazakh poet Abay Kunanbayev (figure 1). A book of poems using augmented reality is a fascinating story with an instructive meaning. When you hover your phone's camera, the book's landscapes come to life, reproducing the book's " live " story.

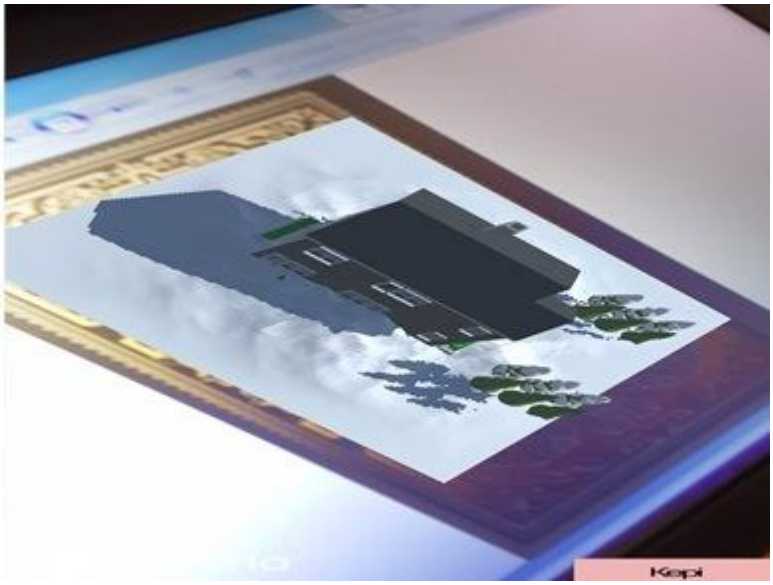

Figure 1 – Augmented reality to poems about winter

Augmented reality for poems is developed on the Vuforia platform. Vuforia is an augmented reality platform and Toolkit for developing augmented reality software for mobile devices developed by Qualcomm. Vuforia uses computer vision technologies, as well as tracking flat images and simple three-dimensional real objects in real time.

Figure 2 – Augmented reality for Abay Kunanbayev's translation
«Mountain peaks sleep in the darkness of the night…»

Vuforia can recognize text, also has the ability to recognize cylindrical markers. The ability to register images allows developers to position and Orient virtual objects, such as 3D models and media content, in conjunction with real images when viewed through mobile device cameras.

The specificity of augmented reality is that it visually combines two initially independent spaces: the world of real objects and the virtual world created on a computer.

The virtual object is oriented on the real image so that the observer's point of view applies to them in the same way to achieve the main effect – the feeling that the virtual object is part of the real world. The app supports various 2D and 3D target types, including unmarked Image Targets, three-dimensional Multi-Target targets, and reference markers that highlight objects in the scene for recognition. Vuforia provides application programming interfaces in C++, Java, Objective-C, and .Net through integration with the Unity game engine. Thus, it supports the development of AR applications for iOS and Android, while assuming development in Unity and is compatible with a wide range of devices, including iPhones, iPads, smartphones and Android tablets.

Results and Discussion. The question about the possibility of using augmented reality technology in education can be answered in the affirmative, because this technology allows you to make lessons exciting, interesting, and understandable. Using augmented reality, you can" animate "static pages of books and textbooks, take a walk through the jungle, feel like a participant in a historical event, or "draw" associations that arise when reading literary works or listening to music [2].

In addition, in some educational organizations, the implementation of practical training may be difficult or impossible: for example, there are no necessary chemical reagents or mineral / rock rocks to demonstrate them to students. Thus, the situation in the field of education, concerning practical training, determines the relevance of the use of new information technologies in the field of education. One of the promising areas of development of innovative educational technologies is the use of augmented reality in the learning process.

However, electronic information or interactive tools are most often used in almost all areas of training. Almost all schools equip classrooms with computer equipment, projection equipment, electronic learning resources, and other modern learning tools. Most often, the capabilities of this technique are not fully used. Augmented reality can be used in the study of any subject, whether it is physics or history, biology or literature. Already now you can find many programs for young mathematicians (Pocket Tutor), novice biologists (AR Flashcards) and others [3].

Like any new technology, AR has its advantages and disadvantages. On the one hand, it allows you to significantly expand the possibilities of the educational process. The school must keep up with the times and demonstrate to children what they will have to work with in the near future. The disadvantages of this technology go beyond the educational process and are primarily related to social consequences (the use of contact lenses with augmented reality, problems related to the confidentiality of information [4]).

At the present stage of development of computer technologies, it is necessary that augmented reality technologies influence learning technologies, enriching their tools and methods, expanding didactic and cognitive capabilities. Placing virtual objects in a specific environment where they are not initially available would allow you to model unusual educational practices.

How can augmented reality technology be used in the educational process? First of all, as an auxiliary tool for maximizing the visibility and interactivity of the studied subject, deeper immersion in it, and conducting virtual laboratory work.

The use of such technology as augmented reality provides students with the opportunity to practice their theoretical knowledge absolutely safely, for example, to conduct chemical experiments and experiments, to visualize algorithms for sorting arrays or encoding information, to see how individual parts of the computer work, etc., to visualize objects presented in educational materials. [5,6] thus, the visibility of the content of education is significantly increased, moreover, since the technology is quite new, and its use requires the usual gadgets for modern students-smartphones, it increases the interest of students in the discipline being studied.

Using augmented reality and 3D modeling together motivates students to learn programming and 3D modeling [7,8]. This technology can be used when performing project tasks, to visualize the results of students ' work on the project, making it as interactive as possible.

Various platforms are used to develop augmented reality applications. These are platforms such as Vuforia – a leading computer vision platform with more than 300,000 developers, ViewAR SDK-ViewAR's first customers were furniture companies, but now The company offers powerful 3D visualization tools, TryLive Retail - a new reality for brands and stores, SmartCam3D View-an augmented reality application for drones, but you can use its capabilities in development by applying

geographical labels to the image, InfinityAR-the platform can build a three-dimensional scene of the surrounding space and add the necessary elements, and others.

Conclusion. Thus, the technology of augmented reality allows the teacher to involve students in research, developing educational situations for this purpose, using modern technologies, tools and methods of activity to achieve a high-quality result of knowledge. Placing virtual objects in a specific environment in which they are not initially available allows you to model unusual educational practices that affect learning technologies, enriching their tools and methods, expanding didactic and cognitive capabilities, and providing ample opportunities to improve the quality of education. Elements of augmented reality developed in the course of research can be used in teaching directly in literature lessons, and similar elements can be developed for other disciplines on their basis. The use of augmented reality elements in training helps to increase motivation to use gadgets for solving educational tasks, interest in the educational process due to the visibility and novelty of the technology, and therefore a better understanding of the educational material.

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VUFORIA ПДАТФОРМАСЫНДА ТОЛЫҚТЫРЫЛҒАН НАҚТЫЛЫҚ ҚОСЫМШАЛАРЫН ӘЗІРЛЕУ ЖӘНЕ ОҚУ ҮДЕРІСІНДЕ ПАЙДАЛАНУ

Аннотация. Бүгінде білім беру саласында толықтырылған нақтылық технологиясы болашағы бар саланың бірі болып есептеледі. Оқу үдерісінде толықтырылған нақтылық технологиясын қолдану жаңа бағыт болып саналады және соңғы уақытта тарих, география, әдебиет сабағында AR (Augmented Reality) технологиясы қолданыла бастады.

Кеңейтілген немесе толықтыратын ақпараттар мәтін, кескін, бейне, дыбыс, үшөлшемді цифрлық нысандар болуы мүмкін. Кеңейтілген нақтылық технологиясының мүмкіндігін пайдалана отырып, көптеген құбылыстар мен үдерістерді нақты өлшемдері мен белгілерін сақтай отырып айқындауға болады.

Жалпы, кеңірек алғанда, аталған технология цифрлық технологияларды пайдалана отырып, адамның қоршаған әлем туралы түсінігін кеңейту қағидаларына иек артады. Ал жеке алып қарағанда, бейнекескінді басқару, яғни оған нақты уақыт режимінде жаңа нысандарды қосу болып есептеледі.

Кеңейтілген нақтылық технологиясын оқу үдерісінде қолдану көрнекілік пайдаланып оқытуды жаңаша тұрғыда қарастыруды қажет етеді. Кеңейтілген нақтылық технологиясы көпшілікке қолжетімді, түсінікті және оны жүзеге асыру виртуалды әлемді іске асыруға қарағанда жеңіл болып келеді.

Көптеген сарапшылар кеңейтілген нақтылық технологиясын «жетілдірілген», «қосымша» және тағы да басқа атаулармен атайды. Дегенмен «кеңейтілген нақтылық» атауы ақылға қонымды болып көрінеді, себебі қоршаған әлемді виртуалдық әлемнің нысандары арқылы толықтыруға немесе нысандарды керісінше алып тастауға болады.

Мақалада Vuforia платформасында кеңейтілген нақтылық қосымшаларын әзірлеу, көрнекі ақпаратпен мәліметтерді толықтыру үшін оқу материалдарын визуалды модельдеу мақсатында оқу үдерісінде кеңейтілген нақтылық технологиясын пайдалану мәселелері қарастырылған.

Кеңейтілген шындық қосымшалары, платформалары, кеңейтілген шындық технологиясын іске асыру мен Unity қосылған Vuforia секілді әзірлемелердің құрал-сайман мүмкіндіктерін талдаудың нәтижелері көрсетілген.

Кеңейтілген нақтылық жоғары деңгейлі технологияларды қолданудың маңыздылығы, кеңейтілген нақтылық технологиясын қолдану перспективалары және оқу үдерісінде пайдалану мүмкіндіктері мен артықшылықтары көрсетілген.

Білім беру саласындағы жаңа ақпараттық технологияларды қолданудың маңыздылығы және инновациялық білім беру технологиясын дамытудың перспективалы бағытының бірі оқыту үдерісінде кеңейтілген нақтылықты қолдану ерекшелігі айқындалды. Маркерлік технология негізінде құрылған Абай Құнанбаев өлеңдеріне кеңейтілген нақтылық қосымшасы ұсынылды.

Түйін сөздер: кеңейтілген нақтылық, AR технологиясы, Vuforia платформасы, маркер, тану, интерактивті технологиялар, цифрлық білім беру технологиялары, оқу үдерісі.

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РАЗРАБОТКА ПРИЛОЖЕНИЙ ДОПОЛНЕННОЙ РЕАЛЬНОСТИ НА ПЛАТФОРМЕ VUFORIA И ИХ ПРИМЕНЕНИЕ В УЧЕБНОМ ПРОЦЕССЕ

Аннотация. На сегодняшний день образование считается одним из наиболее перспективных направлений для развития и внедрения технологий дополненной реальности. Идея применения дополненной реальности с целью обучения – достаточно новая и AR (Augmented Reality) технологии недавно используются на уроках истории, географии, литературы.

Дополняющая информация может быть в виде текста, изображения, видео, звука, трехмерных объектов. Воспроизведение некоторых процессов с помощью дополненной реальности позволяет наглядно представить процесс в реальных размерах и возможностях. Принцип технологии в широком смысле кроется в изменении представления человека о реальном мире с помощью цифровых технологий. В более узком смысле – это добавление новых объектов к видеоизображению в режиме реального времени.

Использование технологии дополненной реальности в образовательных целях позволяет рассматривать возможности наглядного обучения в совершенно новом ракурсе. Дополненная реальность – она более понятна большинству людей, ее проще воплотить, чем виртуальные миры и она доступна.

Многие эксперты называют дополненную реальность «улучшенной», «расширенной» и даже «дополнительной». Более точным все же будет название «дополненная реальность», так как данная технология может как дополнять окружающий мир объектами мира виртуального, так и устранять из него объекты. В продолжение уточнения можно привести определение дополненной реальности (augmented reality, AR) как «среда с прямым или косвенным дополнением физического мира цифровыми данными в режиме реального времени при помощи компьютерных устройств – планшетов, смартфонов и инновационных гаджетов, а также программного обеспечения к ним».

В статье рассмотрены вопросы разработки приложений дополненной реальности на платформе Vuforia, а также использование технологии дополненной реальности в учебном процессе с целью визуального моделирования учебного материала для дополнения материала наглядной информацией.

Показаны результаты анализа существующих подходов к разработке приложений дополненной реальности, платформы, инструментальные среды разработки, такие как Vuforia, с возможностью подключения Unity и реализация технологии дополненной реальности.

Подчеркнута важность применения высокоуровневых технологий дополненной реальности, перспективы применения технологии дополненной реальности, возможности и преимущества ее использования в учебном процессе.

Отмечено, что ситуация в сфере образования обуславливает актуальность применения новых информационных технологий в сфере образования и одним из перспективных направлений развития инновационных образовательных технологий является применение дополненной реальности в процессе обучения. Предложена созданная на основе маркерной технологии приложение дополненной реальности к стихам Абая Кунанбаева.

Ключевые слова: дополненная реальность, AR-технология, платформа Vuforia, маркер, распознавание, интерактивные технологии, цифровые образовательные технологии, учебный процесс.

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DECLINE AND GROWTH FACTORS OF CREATIVE ACTIVITY OF KAZAKHSTAN COMPOSERS IN THE 1990-2000-IES

Abstract. Based on objective data (the number of works written in major genres), I reveal a wave of decline and growth in the creative activity of Kazakhstan composers, which spanned two decades between 1990-ies and 2010-s. The article is devoted to an attempt to identify the external and internal causes of such statistics. The influence of the historical situation and the transformations of the cultural and ideological plan on musical creativity is analyzed. In my opinion,external factors affecting the creative activity of Kazakhstan composers are political changes and the ideological transformations associated with them, economic downturns and ups, as well as a system of intercultural interaction that is naturally transforming in the global world. A very indicative situation in the field of musical theater, which can be extrapolated to other genre spheres. It demonstrates a decline throughout the second half of the 1980s until the early 2000s.

Among the factors that influenced the growth of creative activity in the late 1990s and early 2000s, state programs for the preservation of cultural heritage, new music festivals Nauryz-21, new technical capabilities (the emergence of modern recording equipment and computers, informatization) should be mentioned, expanding the scope of international and intercultural contacts. One of the most noticeable results of the activation of composer creativity was the formation of Kazakhstan polystylistics, which is characterized by a multi-vector combination of styles not only from different eras, but also from different musical and cultural traditions.

Key words: composers of Kazakhstan, Kazakh music of independence period, polystilistics in Kazakh music, intercultural interaction, state programs for culture.

Introduction. Composers, whose creative activity mainly fell on the 1990s - 2000s, spent most of their professional career in the new socio-political conditions – in independent Kazakhstan. Analysis of their creative activity shows unevenness in the development of different genres and directions. Recessions and growth coincide with political, economic and sociocultural changes in the life of the republic. The new ideological situation also entailed the transformation of the content side of academic music, its aesthetic attitudes and compositional techniques. Having traced in detail the influence of external factors on musical creativity, I will not only reveal the underlying causes of creative recessions and growths, but also try to identify the conditions under which a further increase in the creative activity of Kazakhstan composers is possible.

Methods. The impetus for thinking about the downturns and growth in the creative activity of Kazakhstan composers was the statistical analysis that remained outside the scope of this article. In this study, an integrated and systematic approach is applied, allowing to consider composer creativity in the cultural system. The aspect of the interaction of cultures involves the application of semiotics.

Discussion. The era of *perestroika* and the first years of independence coincided with some decline in creative activity. This decline is most noticeable in the field of opera: after the premiere of G. Zhubanova's opera *Twenty Eight* in 1980, the next premiere took place in 1990 (*Makhambet* by B. Zhumaniyazov) and the next in 2000 (*Ablai Khan* by E. Rakhmadiev). Of course, there are many reasons, and they should be considered in conjunction. Apparently, the main reason is social. In an era of change, people and nations have the highest priority – to survive. Art fades into the background. In the first decade of independence, the level of state funding for art fell, composers stopped receiving fees from the Union of Composers of Kazakhstan. The opera house and concert organizations were forced to survive

in the new market conditions, so there were no commissions for works from them. However, the recession cannot be attributed solely to economic reasons. Let us recall the story of the creation of the famous Seventh Symphony by Shostakovich in besieged Leningrad.

A number of prerequisites for a creative decline in cultural and ideological situation should also be highlighted – the value orientations of the Soviet era have collapsed, new ones have not yet settled down, as testified by U. Jumakova: "The mentioned historical fact that the extinction of the composer's activity did not indicate a decrease in its relevance in national culture. It expressed the *exhaustion of the creative tasks posed by this era and the need to update them* in connection with the changed artistic and aesthetic situation." [1] Accustomed to living in the conditions of a permanent crisis in the 1990s, people were more concerned about personal well-being than about high patriotic ideals, of which Kazakhstan music is undoubtedly a part. Media, spreading low-standard mass culture promoted an active demoralization of a society. The passivity of the intelligentsia contributes no less to it, on which the formation of a common national idea and the construction of a society focused on patriotic ideals largely depend. This is evidenced by representatives of various fields of science and art. Thus T. Jumalieva and G. Saduahasova note stagnation in the activities of Kazakhstani music critics: "One of the significant shortcomings of the national idea of music is, in our opinion, that today music criticism remains socially indifferent. It lacks social activity, efficiency, while the critic must be a preacher, a teacher who seeks to make society better, more moral" [2, p.211].

In the 2000s, some revitalization was outlined in the field of musical creativity. This was facilitated by a number of measures to develop and implement a national cultural policy, taken at the initiative of the President of the Republic of Kazakhstan N.A. Nazarbayev. Thus, in 2004-2006, the program "Medeni Mura" ("Cultural Heritage") was implemented, which launched the strategic national project "Cultural Heritage", which involves the phased implementation of the concept of the project aimed at developing the spiritual and educational sphere, ensuring the preservation and effective application of the cultural heritage of the country [3]. According to the Program for the Development of the Sphere of Culture for 2006-2008, in 2007 the state allocated 30 composer grants [4], and in 2008 - sixteen [5].

Significant role in enhancing the creative activity of composers played festivals of contemporary music *Nauryz –XXI*, ongoing in the Kurmangazy Kazakh National Conservatory, plenary sessions and concerts of the Union of Composers, concerts of contemporary music [6]. All this was reflected in specific opuses. Among the major works of recent years, the *Sixth "Ecological" symphony* and chamber opera *On the MAIL.RU website* by B. Bayakhunov, three symphonic poems (*Tolghau, Dala Syry* and *Zhamilya*) and the ballet *Heavenly Nomad* by A. Raimkulova, the ballet *The Prince of the Three Kingdoms* by V. Strigotsky, the opera *Tomiris* and the ballet *Tlep and Sarykyz* by A.Serkebaev, ballets *Mahabbat perishtesi* (*The Peri of Love*) and *The Wooden beauty* by B. Daldenbai, the ballet *Blue minaret* and ballet-oratorio *Eternal flame* by S.Erkimbekov, opera *Domalaq-ana* by D. Botbaev, the opera *Battle of Otrar* by M. Mangitayev, the Symphony *Sacrifice of Tengri* and the orchestral piece *Niagara* by A. Bestybayev, symphonic *kui-tolgau* for the orchestra of folk instruments *Confession of the steppes* by A. Mambetov, the symphonic picture *Zhalantos-Batyr* by K. Duysekeyev, the ballet *Nauryz meiram hikayasy* by B. Kadyrbek, etc.

Unfortunately, not all of the named operas and ballets can be heard in concert halls or seen in musical theaters. Opera houses, dependent on government subsidies, are wary of a new works, for the production of which fundraising is required. Nevertheless, the premiere of the opera *Tomiris* and the ballet *Tlep and Sarykyz* by A.Serkebaev, the opera *Makhambet* by B. Zhumaniyazov in Abai State Opera and Ballet Theatre, the Astana premiere of the ballet *Eternal Flame* by S.Erkimbekov, the ballet *Kalkaman and Mamyr* by B.Kadyrbek, musical and choreographic composition *The Legend of Batyr Bayan* by F.Zhanno and B.Tleuhan suggests starting interest to theater productions of new works. One of the reasons for the small number of productions may be the relatively low level of performance, which was noted long before the political upheavals of the 1990s. So G. Zhubanova wrote about the prospect of staging her opera *Buranny Edyge*, the clavier of which she finished in 1991: "I don't give the opera to the theater yet. Not the time... But I put so much effort into this opera. I'm afraid they will disappoint me..." [6]. The production of *Tomiris* by A. Serkebaev, which places high demands on performers in both acting and technical skills, outlined positive changes in this regard [7, p. 10].

Representatives of a young generation of composers have successfully started their carriers. T. Nildikeshev made his debut, presenting the ballet *Station Warden*. The musical *Kyz Zhibek* is being

staged to the music of S. Shamenov and D. Raev. Works and songs by T. Zharmuhamed are performed in concerts for the orchestra of folk instruments. S. Baiterekov and R. Abdysagin, representing Kazakhstan at international composers' competitions and courses, began an active career.

Kazakhstan composers are open to new ideas and creative experiments. Among the innovations of recent decades, the expansion of technical means, the combination of different genres and types of art, compositional findings in the implementation of *kui*, polystylistic searches. Technical means include not only new computer and acoustic technologies (as in A. Raimkulova's play "The Shaman's Soul" for cello and recording or in V. Strigotsky's ballet "The Prince of Three Kingdoms", which uses synthesized tones of Korean folk instruments), but also updating of the instrumentation (for example, the Turan folk ensemble in the symphonic works of A. Raimkulova). Genre synthesis and synthesis of the arts can be seen in such works as the opera-ballet *Kalkaman and Mamyr* by B.Kadyrbek ballet *Eternal Flame* by S.Erkimbekov. Almost every composer works in the field of modern rethinking of traditional forms and methods of composition; from recent experiments, one can name the ballet *Mahabbat peristhesi*" by B. Daldenbaev, the symphonic *kui-tolgau* for the orchestra of folk instruments *Confession of the Steppes* by A. Mambetov, the symphonic opuses by A. Raimkulova and many other works. The vector of polystylistics in the works of Kazakhstan composers has always been guided by the East-West context. In recent years, B. Bayakhunov, A. Bestybaev, V. Strigotsky and other composers have been working in this direction.

An important role in enhancing creative thought is played by the access of Kazakhstani musical culture to world scenes. Since 1992, Kazakhstani musical groups and performers have been representing the culture of their country abroad as a valuable phenomenon (and not as part of Soviet music). In the wake of interest in the "world music", which captured the musical community of North America and Europe in the 1980-2000s, "nomadic romanticism" and the peculiar exotic of Kazakh music are well received by Western listeners. Bearers of oral traditions (for example, *kobyzist* Raushan Orazbaeva, *zhyrau* Almas Almatov), and groups representing the so-called Soviet-influenced musical nationalism – orchestras and ensembles of folk instruments (Kurmangazy State Academic Folk Orchestra, Academic Folk-Ethnographic Orchestra named after N. Tlendiev, Otrar Sazy orchestra, Sazgen Sazy ensemble), and artists working in the new European tradition (State Brass Band and composer A. Bestybayev, violinist M. Bisengaliev) [8].

The activation of external relations stimulates creative activity within Kazakhstani culture, generating, for example, such phenomena as intra-oriental synthesis (Bayakhunov's term) – a combination of elements of different non-European cultures (raga and Kazakh melos, Altai throat singing and *kui*, etc.) in the works of the New European tradition., the fusion of ethnic music and mass genres (ethno-pop, ethno-rock, ethno-jazz) [10]. Kazakh composers adopt many of the trends inherent in Western art.

In the twentieth century in European, and then in North American music, there is a tendency to expand the boundaries of culture through an appeal to the art of other eras and peoples. It is characteristic of such artistic directions as neo-archicism, neoclassicism (and its types), neo-folklorism, polystylistics, World music [11]. All of them are focused on several historically or geographically different styles or creative forms. At the same time, within the framework of one work, self-valuable and fairly tight music systems are combined. This "depressurization" of traditions provides a multidimensional cultural space.

Rapid informatization and increased mobility of representatives of different cultures have been especially intensified since the late 1980s. With the collapse of the Soviet Union, Kazakh culture becomes involved in these global processes. The bipolarity that prevailed at the dawn of the formation of the national composer school (folklore - professional creativity) has faded already in Soviet times. On the one hand, composers and scholars recognized the heterogeneity of traditional art[1], on the other hand, representatives of various nationalities and ethnic groups appear within the framework of one composer school, introducing through their individual style a variety of cultures within the framework of one system.

The preconditions for the multidimensionality of the cultural space in Kazakhstan have developed due to historical circumstances: representatives of about 120 nationalities live in the republic, 25 of which are represented by large diasporas (from 20 thousand people). Each of them preserves its traditions, often

[1] First of all, I mean the landmark publications of N. G. Shakhnazarova: "Musical professionalism in the context of culture" [13] and "Music of the East and music of the West: Types of musical professionalism" [14].

in a more preserved form than in their historical homeland. The Uyghur and Dungan cultures through the composer school of K. Kuzhamyarov (the first Uyghur composer) and his student B. Bayakhunov (the first Dungan composer) formed a layer of national academic music of the European tradition. The nomadic culture of the Kazakhs is characterized by contacts with ethnically related peoples – Turkmens, Karakalpaks, Uighurs, Kyrgyz, and others, as well as with peoples living on the Great Silk Road [12].

Three aesthetic trends were initiated in the 1980s , and distinguished in the 1990s – 2000s, reflecting the multidimensionality of modern culture: an appeal to the past of the people, "intra-oriental synthesis" and an appeal to Western artistic movements (polystylistics, neoclassicism) [8, p.50]. All of them are implemented with the introduction of national flavor.

The already mentioned interest in the past and its artistic comprehension causes an intensive search for ways to creatively implement the idea of the connection of time, veneration of ancestors, shamanistic rites, etc. They can be combined into a *neo-archaic tendency*. The revival of various archaic traditions takes place at the level of the whole world culture [9], and in this sense, Kazakh music demonstrates a high degree of inclusion in world cultural processes.

The sphere of traditional life and art in Soviet times was, in fact, limited to the period of the XIX century. A new look at the history of the Kazakhs, finds of traces of the ancient nomadic civilizations of the Huns, Scythians, Turks; ethnographic and ethnolinguistic studies have led to a specific direction of neoarchicism in Kazakh art: translating the romance of nomadic civilizations through the history and mythological images of Saks and Turks, reviving the religion of Tengrianism.

Archaic is manifested not only in academic music [10]. It has traces in folklore (e.g., revival tools saz- syrnay, zhetygen, sherter, sybyzgy et al. Bolat Sarybaeva [10]), and in particular its embodiment in relief mass music and a variety of creative culture experiments junction layers (traditional and mass, traditional and academic music, etc.).

Along with this trend, directions of neoclassicism and polystylistics receive a kind of refraction on Kazakh soil, although works of this kind are few in number. Most vividly and consistently they are presented in the works of V. Novikov and B. Bayakhunov. Sporadically G. Zhubanova, A. Meirbekov, M. Sagatov and other composers addressed the principles of neoclassicism. The specificity of Kazakh polystylistics consists in combining not only texts of different eras, but also texts of different traditions, for example, Baroque and Kazakh folk songs in the sonata "Kazakh Bahian " by B. Bayakhunov [11, p.117].

The manifestations of the marked directions on the Kazakh material will be discussed in detail in the second chapter. If we talk about them in the context of the cultural model, a system of two coordinates is formed: *horizontal or chronological* (referring to the past) and *vertical or cultural* (referring to other cultures). Dialogue with other cultures of preceding or modern eras is an essential sign of culture as such. The difference between the Kazakh model and any other is more likely to be in the details: a greater or lesser deviation of the vector of expansion of the text of the national culture towards the horizontal or vertical axis. In view of the rethinking of the cultural heritage of the people that took place in the first decades of independence, the predominant direction so far has been chronological as defined by the processes of rethinking the cultural code [13].

The cultural direction finds special expression in Kazakh music. Interest in the origins of native culture leads to the study of other eastern cultures. If the theme of dialogue between the East and the West was present in one way or another in the work of Kazakh composers since the founding of the composer's school, then the dialogue between the East and the East is an innovation rooted in the foundations of nomadic culture (Turkmen kui in the West Kazakhstan tradition, interest in Tatar songs, Tajik dances A.Zhubanova, etc.). As B. Bayakhunov aptly put it, combining in one piece the principles of Indian stew, jazz and Kazakh kyu, as well as the generalized transmission of the color of Central Asia (A. Bestybaev) can be called " intracostal synthesis" [12, p. 50]. In his work, the composer himself turns to specific expressions of the East through an appeal to Japanese, Chinese, Indian, Jewish, Tajik, Arabic and, of course, Dungan and Kazakh music. B. Amanzhol shows similar cultural interests, although their creative implementation differs significantly among composers. The persuasiveness of intracostal synthesis is achieved through deep penetration into culture, the study of its foundations both in ethnomusicological works and through personal ethnographic practice.

Conclusion. So, external factors influencing the creative activity of Kazakhstani composers are political changes and the ideological transformations associated with them, economic downturns and ups,

as well as a system of intercultural interaction that is naturally transforming in the global world. A very indicative situation in the field of musical theater, which can be extrapolated to other genre spheres. It demonstrates a decline throughout the second half of the 1980s until the early 2000s.

Among the factors that influenced the growth of creative activity in the late 1990s and early 2000s, state programs for the preservation of cultural heritage, new music festivals Nauryz-21, new technical capabilities (the emergence of modern recording equipment and computers, informatization) should be mentioned, expanding the scope of international and intercultural contacts. One of the most noticeable results of the activation of composer creativity was the formation of Kazakhstan polystylistics, which is distinguished by a multi-vector combination of styles not only from different eras, but also from different musical and cultural traditions.

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1990-2000 ЖЫЛДАРДАҒЫ ҚАЗАҚСТАНДЫҚ КОМПОЗИТОРЛАРДЫҢ ШЫҒАРМАШЫЛЫҚ БЕЛСЕНДІЛІГІНІҢ ТӨМЕНДЕУ ЖӘНЕ ӨСУ ФАКТОРЛАРЫ

Аннотация. Шығармашылық қызметін негізінен 1990-2000 жылдары бастаған композиторлар кәсіби жолдың басым бөлігін жаңа әлеуметтік-саяси жағдайда – тәуелсіз Қазақстанда өткізді. Қайта құру дәуірі және тәуелсіздіктің алғашқы жылдары шығармашылық белсенділіктің құлдырауымен тұспа-тұс келді. Бұл құлдырау, әсіресе опера өнері саласында ерекше сезіле бастады. Оған басты себеп – әлеуметтік-экономикалық жағдайдың әсері болды. Тәуелсіздіктің алғашқы онжылдығында өнерді мемлекеттік қаржыландыру деңгейі төмендеді, композиторлар Қазақстан композиторларының Одағы желісі бойынша қаламақы алуды тоқтатты. Опера театры мен концерттік ұйымдар нарықтың жаңа жағдайында өмір сүруге мәжбүр болды, сондықтан олардан жұмыс жасауға тапсырыс болмады. Алайда, құлдырауды тек экономикалық себептер арқылы түсіндіруге болмайды. Идеологиялық сипаттағы шығармашылық құлдыраудың бірқатар алғышарттарын да атап өткен жөн – кеңес дәуірінің құндылық бағдарлары құлдырады, жаңалары әлі орныққан жоқ еді.

2000-жылдары музыкалық шығармашылық саласында бірқатар жандану байқала бастады. Бұған Қазақстан Республикасының Президенті Н.Ә.Назарбаевтың бастамасымен қабылданған ұлттық мәдени саясатты әзірлеу және іске асыру бойынша бірқатар шаралар ықпал етеді. 2004-2006 жылдары «Мәдени мұра» («Культурное наследие») бағдарламасы жүзеге аса бастады. Композиторлардың шығармашылық белсенділігін арттыруда «Наурыз – XXI» заманауи музыка фестивальдері, Композиторлар Одағының пленумдары мен концерттері, заманауи музыка концерттері елеулі рөл атқарады. Осының барлығы белгілі композиторлар Б.Баяхунов, А.Серкебаев, Б.Дальденбай, С Еркімбеков, А.Райымқұлова, М.Манғитаев, А.Бестыбаев, А.Мәмбетов, К.Дүйсекеева, Б.Қадырбек және т.б. нақты шығармашаларында көрініс табады. Соңғы онжылдықтағы инновациялар арасында техникалық құралдарды кеңейту, түрлі жанрлар мен өнер түрлерін біріктіру, күйшілікті жүзеге асырудағы композициялық табыстар, полистилистикалық ізденістер байқала бастады.

Шығармашылық ойды жандандыруда қазақстандық музыкалық мәдениеттің әлемдік сахнаға шығуы маңызды рөл атқарады. 1992 жылдан бастап қазақстандық музыкалық ұжымдар мен орындаушылар шетелде өз елінің мәдениетін кеңестік музыканың бір бөлігі ретінде емес, өзіндік феномен ретінде ұсынады. 1980-жылдары ерекшеленіп, ал 1990-200-жылдары қазіргі заманғы мәдениеттің көптүрлілігін көрсететін үш эстетикалық үрдістер дамиды: халықтың өткеніне үндеу, «шығысішілік синтез» және батыстың көркемдік ағымдарына (полистилистика, неоклассицизм) бет бұру [1, 50-б.]. Олардың барлығы ұлттық нақышпен, ұлттық реңкпен жүзеге асырылады.

Өткенге және оның көркемдік ой-пікіріне деген қызығушылық уақыт байланысы, ата-бабаларды құрметтеу, шамандық әдет-ғұрып және т.б. идеяларын шығармашылық жүзеге асыру жолдарын іздестіруді туындатады. Әртүрлі архаикалық дәстүрлердің қайта жаңғыруы бүкіл әлемдік мәдениет деңгейінде жүріп жатыр [2], бұл тұрғыдан алғанда қазақ музыкасы әлемдік мәдени үдерістерге қосылудың жоғары деңгейін көрсетеді.

Осы үрдіспен қатар қазақ топырағында өзінше ұғынылуы, ондай шығармалар қатары аз болса да, неоклассицизм мен полистилистика бағытына бет алады. Олар В. Новиков пен Б. Баяхуновтың шығарма-

шылығында айқын және дәйекті түрде ұсынылған. Екі координаттан тұратын жүйе қалыптасады: *көлденең* немесе *хронологиялық* (өткенге жүгіну) және *тік* немесе *мәдениеттанымдық* (басқа мәдениетке жүгіну).

Қазақстандық композиторлардың шығармашылық белсенділігіне әсер ететін сыртқы факторларға саяси өзгерістер және олармен байланысты идеологиялық трансформациялар, экономикалық құлдыраулар мен өсімдер, сондай-ақ жаһандық әлемде табиғи өзгеріп жатқан мәдениетаралық өзара екіжақты қатынас жүйесі жатады. Басқа жанрлық салаларға шығаруға болатын музыкалық театр саласындағы көрнекі жағдай. Бұл 1980-жылдардың екінші жартысынан 2000-жылдардың басына дейінгі құлдырауды айқын көрсетеді.

1990 жылдардың соңы мен 2000 жылдардың басында шығармашылық белсенділіктің өсуіне ықпал еткен факторлар арасында мәдени мұраны сақтау жөніндегі мемлекеттік бағдарламаларды, «Наурыз – 21» атты жаңа музыка фестивалдерін, жаңа техникалық мүмкіндіктерді (қазіргі заманғы дыбыс жазу аппаратурасы мен компьютерлердің пайда болуы, ақпараттандыру), халықаралық және мәдениетаралық байланыстар саласының кеңеюін атап өткен жөн. Композиторлық шығармашылықтың белсенді болуының ең елеулі нәтижелерінің бірі қазақстандық полистилистиканың қалыптасуы еді, ол тек түрлі дәуірлердің ғана емес, сонымен қатар түрлі музыкалық-мәдени дәстүрлердің көпвекторлы қосылуы арқылы ерекшеленді.

Түйін сөздер: Қазақстан композиторлары, тәуелсіздік кезеңіндегі қазақ музыкасы, қазақ музыкасындағы полистилистика, мәдениетаралық өзара екіжақты қатынас, мәдениет бойынша мемлекеттік бағдарламалар.

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ФАКТОРЫ СПАДА И РОСТА ТВОРЧЕСКОЙ АКТИВНОСТИ КАЗАХСТАНСКИХ КОМПОЗИТОРОВ В 1990-2000-Х ГОДАХ

Аннотация. Композиторы, чья творческая деятельность в основном пришлась на 1990-е – 2000-е годы, большую часть профессионального пути провели в новых социально-политических условиях – в независимом Казахстане. Эпоха перестройки и первых лет независимости совпала с некоторым спадом творческой активности. Заметнее всего этот спад в области оперного искусства. По-видимому, основная причина – социально-экономическая. В первое десятилетие независимости уровень государственного финансирования искусства упал, композиторы перестали получать гонорары по линии Союза композиторов Казахстана. Оперный театр и концертные организации были вынуждены выживать в новых условиях рынка, поэтому заказов произведений с их стороны не было. Однако нельзя объяснять спад исключительно экономическими причинами. Следует выделить и ряд предпосылок творческого спада идеологического характера – ценностные ориентиры советской эпохи рухнули, новые ещё не устоялись.

В 2000-х годах намечается некоторая активизация в сфере музыкального творчества. Этому способствует ряд мер по выработке и реализации национальной культурной политики, принятых по инициативе Президента Республики Казахстан Н.А. Назарбаева. Так 2004-2006 годах действовала программа «Мәдени Мұра» («Культурное наследие»). Немалую роль в повышении творческой активности композиторов играют фестивали современной музыки «Наурыз-XXI», пленумы и концерты Союза композиторов, концерты современной музыки. Всё это находит отражение в конкретных опусах известных композиторов Б. Баяхунова, А. Серкебаева, Б. Дальденбая, С. Еркимбекова, А. Раимкуловой, М. Мангитаева, А. Бесты-баева, А. Мамбетова, К. Дуйсекеева, Б. Кадырбек и др. Среди инноваций последних десятилетий расширение технических средств, соединение разных жанров и видов искусства, композиционные находки в претворении кюевости, полистилистические искания.

Немаловажную роль в активизации творческой мысли играет выход казахстанской музыкальной культуры на мировые сцены. С 1992 года казахстанские музыкальные коллективы и исполнители представляют за рубежом культуру своей страны как самоценный феномен (а не как часть советской музыки). В 1980-е годы выделяются, а в 1990-2000-е развиваются три эстетические тенденции, отражающие многомерность современной культуры: обращение к прошлому народа, «внутривосточный синтез» и обращение к западным художественным течениям (полистилистика, неоклассицизм) [1, p.50]. Все они реализуются с привнесением национального колорита.

Уже упоминавшийся интерес к прошлому и к его художественному осмыслению вызывает интенсивные поиски путей творческого претворения идеи связи времён, почитания предков, шаманского обряда и т.п. Их можно объединить в неоархаическую тенденцию. Возрождение различных архаических традиций

происходит на уровне всей мировой культуры [2], и в этом смысле казахская музыка демонстрирует высокую степень включения в мировые культурные процессы.

Наряду с этой тенденцией своеобразное преломление на казахской почве получают направления неоклассицизма и полистилистики, хотя произведения такого плана немногочисленны. Наиболее ярко и последовательно они представлены в творчестве В. Новикова и Б. Баяхунова. Складывается система из двух координат: *горизонтальной или хронологической* (обращение в прошлое) и *вертикальной или культурологической* (обращение к другим культурам).

Внешними факторами, влияющими на творческую активность казахстанских композиторов, являются политические изменения и связанные с ними идеологические трансформации, экономические спады и подъёмы, а также естественно трансформирующаяся в глобальном мире система межкультурного взаимодействия. Весьма показательная ситуация в сфере музыкального театра, которую можно экстраполировать на другие жанровые сферы. Она наглядно демонстрирует спад на протяжении второй половины 1980-х годов вплоть до начала 2000-х.

Среди факторов, повлиявших на рост творческой активности в конце 1990-х – начале 2000-х годов следует назвать государственные программы по сохранению культурного наследия, фестивали новой музыки «Наурыз-21», новые технические возможности (появление современной звукозаписывающей аппаратуры и компьютеров, информатизация), расширение сферы международных и межкультурных контактов. Одним из наиболее заметных результатов активизации композиторского творчества стало формирование казахстанской полистилистики, отличающейся многовекторным соединением стилей не только разных эпох, но и разных музыкально-культурных традиций.

Ключевые слова: композиторы Казахстана, казахская музыка периода независимости, полистилистика в казахской музыке, межкультурное взаимодействие, государственные программы по культуре.

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GEOGRAPHICAL INFORMATION SYSTEMS IN ARCHAEOLOGICAL CARTOGRAPHY OF SOUTH KAZAKHSTAN

Abstract. The article presents available data on mapping based on archaeological exploration with the subsequent involvement of modern GIS technologies. Before the start of work on the compilation of archaeological maps, there was made an analysis of the history of the appearance of similar documents. Research data were taken from both domestic and neighboring countries. It should be noted that current technologies allow you to create maps with accurate data and with detailed reference to the terrain, while using all the available data: these are high-quality space images, radar and GPS data, orthophotomaps with altitude maps. This in turn will give a more detailed understanding of the functioning of the Karaultobe-type monuments being studied. To compile an archaeological map, a database was collected consisting of information about Karaultobe and settlement monuments of the Ispijab historical and cultural district. The main data are the results of exploration and surveys of monuments such as Karaultobe. The analysis was based on experimental methods in GIS. The basis of the maps is radar and GPS data. For analysis, the article used the capabilities of ArcGIS - a special geographic information software product. With the help of special tools, surveys of individual sites and facilities were carried out. The coordinates of each Karaultobe and the altitude map were used separately for analysis. The points themselves, this is a set of data obtained using GPS in field research, in particular because of archaeological exploration. The altitude map is high-resolution radar data (30 meters) available on the US Geological Survey website. Data on the position of the Karaultobe towers, obtained using GPS, were corrected from satellite images to avoid errors. During the work, a digital map was created that can be used to display visibility data from monuments and their work in conjunction with settlement monuments in the region. Objects such as Karaultobe and towns with settlements of the region are studied during the creation of archaeological maps. The basic Karaultobe were chosen as the studied objects. These objects have a characteristic trapezoidal shape and large dimensions with a long range of visibility from them. Settlement structures are chosen based on assumptions about the interaction of towns and settlements with watchtowers. Maps are created for work that includes displaying study analyses as a database, which allows you to further supplement and correct all the information collected. The work on creating the map within the project is aimed at producing a series of maps. This series displays the main map, which displays all objects, as well as individual more detailed maps of the selected regions and maps with the results of terrain analyses. In the publication, authors do not use all maps, but individual, dimensioned options, with simplified annotations. In general, as a result of the creation of a cartographic base on the topic of research, not only maps were prepared, but also a comparative analysis of Karaultobe. Based on these, an important detail in the analysis is the compilation of a table with Karaultobe data. Several Karaultobe chains were analyzed and the boundaries of visibility between them were determined. The results of the analysis are important due to the fact that on the basis of the data obtained it is possible to reconstruct the missing ones as a result of the destruction of Karaultobe, to reproduce their former height. It is also possible to determine the way Karaultobe functions not only in terms of visual contact with settlement monuments, but also as a complex warning system.

Key words: Karaultobe, watchtowers, cartography, GIS, topography, archeology, exploration, landscape.

Introduction. Drawing up an archaeological map is an important and integral stage in the study of the examined territory. Usually, mapping of territories and landscapes occurs after large-scale exploration, during the compilation of sets and inventories. Cartographic studies of archaeological monuments conducted in the 20th century are currently used in the work of archaeological expeditions and in individual works. The method of compiling maps previously implied a simplified display of monuments on the place of relatively modern cities and large rivers. The analysis of limited group monuments was carried out without involving cartography data. The absence of GIS technologies in the past did not provide an opportunity to determine the review and visibility of monuments relative to each other. In the middle and at the end of the 20th century, the result of work in South Kazakhstan (current Turkestan Region) was the Archaeological Map of Kazakhstan [2] and the Set of Monuments of the South Kazakhstan Region [3]. After long-standing cartographic studies that poorly affected Karaultobe in the Turkestan Region, a modern "Map of Karaultobe monuments of the Ispijab district" was compiled as part of the project "Ispijab Watchtowers" using GIS technologies (Geographical Information Systems) based on exploration work of 2018-2019 [4, p.175-184].

Earlier, when studying historical topography, researchers of the Turkestan region drew attention to the structures popularly called "Karaultobe". The term "Karaultobe" is complex. It consists of two parts - "karaul" and "tobe". The word "karaul" is Turkic in origin and translates as "guard". The word "tobe" is used in the Kazakh language and means "hill" or "peak". Hence, the name "Karaultobe" is a guard hill.

A study of Karaultobe showed that watchtowers as a phenomenon are characteristic of the Ispijab historical and cultural district. It is very important that the cities and settlements surrounding Ispijab began to function and develop during the period of spread of the Otrar-Karatau culture. The towns and settlements of Martobe, Ulugtobe and Karatobe are located in close proximity to Sayram itself and arise at the end of the first millennium BC [5, p.70].

At the beginning of the data analysis, a question arose about the nature of the landscape, on the basis of which the map will be built. In modern territories, it is often possible to find prominent anthropogenic effects, including historical ones. The type of landscape suitable for the topic we are studying is defense. The defense landscape in historical times suited all types of fortress structures that had a relief. For example: shafts and ditches, and in our case, specially built structures in the form of watchtowers. These are thoroughly constructed high hills dominating the landscape. During the compilation of the map of objects, local toponyms were used: hydronyms (river names) and oikonyms (city names).

Also, a typological classification was previously carried out. Based on this classification, two types of Karaultobe were identified - basic and sentinel. The basic Karaultobes are impressive in size. These structures have a clear trapezoidal shape. Their diameter reaches 130 m, the height ranges from 8 to 18 m. All these characteristics give the hill excellent visibility on the horizon. Sentinel Karaultobes are small. The diameter of the base is no more than 50 m, the height does not exceed 5 m. These parameters were enough to function around certain centers. This is explained by the fact that natural elevations were chosen for sentinel points [6, p. 21-29].

Before mapping, preparatory work was carried out to compile and complete the database with all the identified Karaultobe for 2018-2019. In total, 65 watchtowers - Karaultobe and 27 settlements and fortifications of the Middle Ages entered into the database. Of these Karaultobe, 26 basic facilities were analyzed. The database also included information on identified settlements located in the foreseeable vicinity of Karaultobe-type facilities. Each Karaultobe and urbanized object is assigned a number in the database list (figure 1).

Methods. During the work, maps are created based on landscape analysis using ArcGIS. As a result, information was obtained confirming some data from archaeological exploration. Similar works with the analysis of the visibility of such objects were previously published, among them it is worth noting the work on the use of GIS in the study of Alan fortifications [7, p.65-72]. There is also similar work on the results of the analysis of the Kislovodskaya basin, where the author describes in more detail the method of using GIS for visibility analysis [8]. For the analysis prepared as part of the Karaultobe monument study project, the ArcGIS capabilities were used, in particular, using the View shed tool. The coordinates of each "tower" and the elevation map were used separately for analysis. The points themselves are a set of data obtained using GPS during archaeological exploration. And the elevation map is SRTM (Shuttle Radar Topography Mission) data available on the website of the US Geological Survey [9].

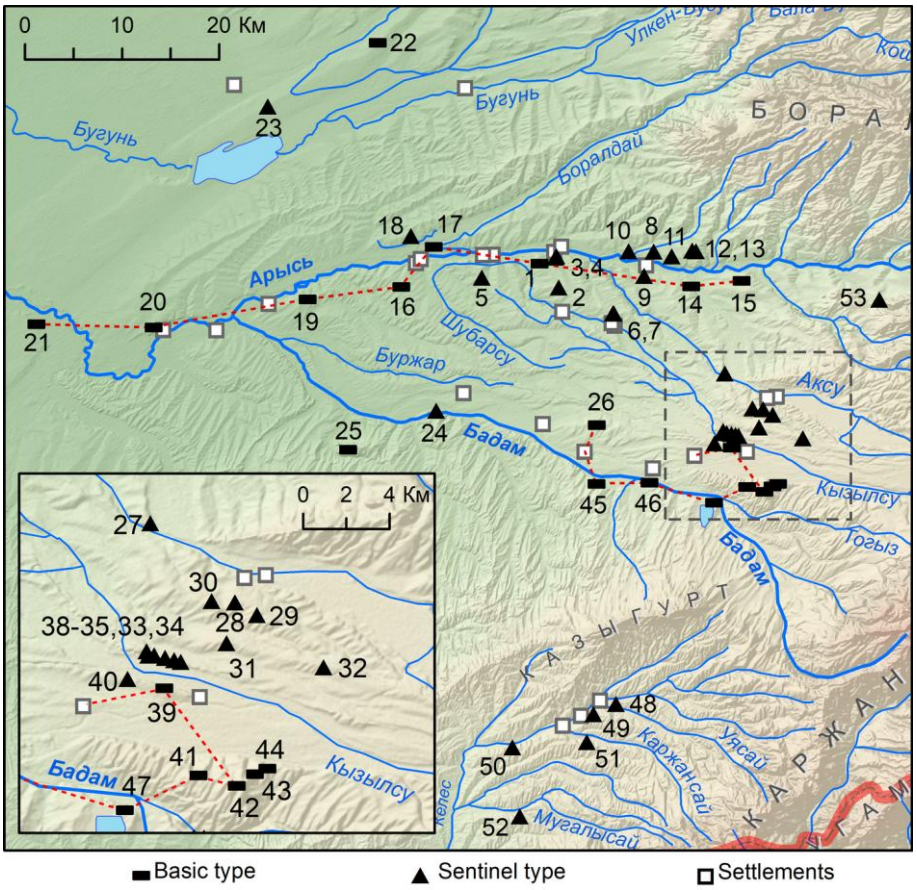

Figure 1 – Archaeological map of Karaultobe-type monuments of Ispijab district

Data on the position of Karaultobe obtained using GPS were corrected by satellite imagery to avoid errors. However, the elevation from the available coordinates was not used at all. This is because SRTM altitude data, although accurate, can go against GPS data due to minor errors in both sources and the 30-meter SRTM grid. At the same time, the results of the analysis may be affected by SRTM inaccuracies in areas of increased vegetation, as well as metal and concrete structures, buildings of various configurations in areas of development [10]. As part of the analysis, the modern height of the structures was not taken into account. The absence of data on the initial size of the structures does not allow the correct analysis of the visual connection of Karaultobe itself and settlement structures (with the exception of individual trial analyses, which are also considered in this article). The results of the analysis showed visibility not from Karaultobe themselves, but the surfaces of the places next to them. This was enough for a reliable analysis of the visibility of objects.

The very height of the Karaultobe structures cannot be noted without detailed field archaeological surveys of each object, which to some extent would give reliable data regarding their height. In this case, the results of the analysis are most important due to the fact that it is possible to try to reconstruct the strategy or plan for choosing places for building "towers" around certain towns and settlements, creating a complex of a Karaultobe-type structure in a certain district.

At the moment, a lot of data has been obtained confirming various assumptions or revealing new details of the choice of places for construction earlier identified objects. In the process of analysis, it became clear the purpose of certain objects that, as previously assumed, were not part of a particular chain. This implies not only their strategic purpose, but also their chronological connection. The results of the analysis suggested the possible position of unrecognized guard hills when there is no mutual visibility between the two neighboring Karaultobe.

Basic objects are selected for landscape analysis. These objects are conditionally divided into two chains: southern and northern. The northern chain covers almost all the basic Karaultobe along the middle

course of the Arys River. The southern chain covered the basic facilities along the Badam River, which are concentrated around large settlements, such as Shymkent and Sayram settlements.

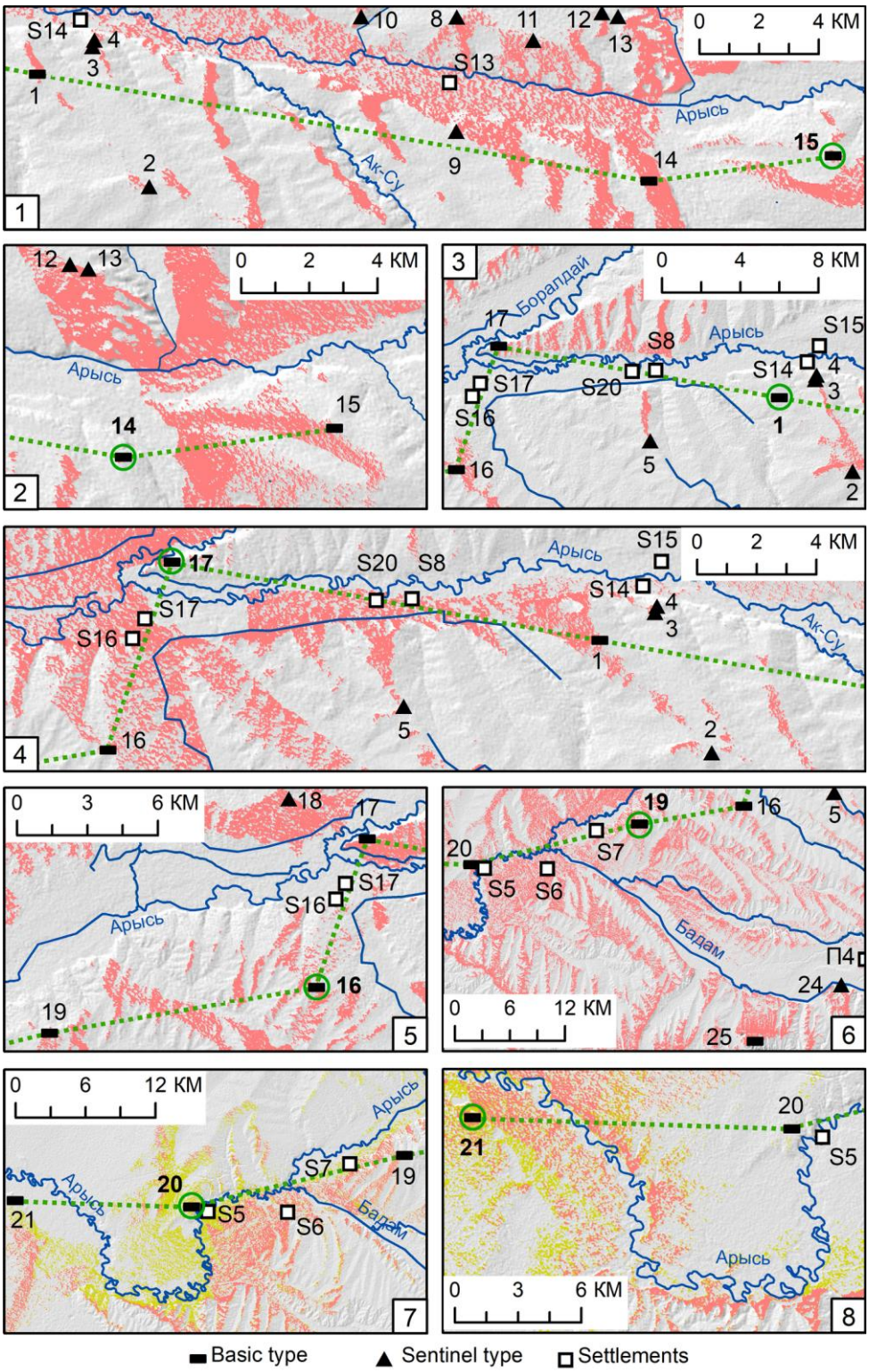

Figure 2 – Results of landscape analysis in the ArcGIS environment (Northern chain).
Red shows visibility from different positions of a certain Karaultobe:
1 - Mashat (15); 2 - Karabulak (14); 3 - Akkoyly-1 (1); 4 - Chubarovka-2 (17);
5 - Chubarovka-1 (16); 6 - Koltogan (19); 7 - Akdala (20); 8 - Darmino (21)

Main part. The results of the analysis discussed in this article are reflected in mini-maps in the form of compressed material, where each one shows a certain Karaultobe and its visibility from different positions (the visibility on the maps is shown in red). The object itself is highlighted by a circle. The site where Karaultobe Mashat (No.15) was erected, according to the results of the analysis, was visible from neighboring basic objects, between which a stipple line is drawn. These are the facilities of Karabulak (No.14) and Akkoyly (No.1) Karaultobes. These watchtowers are located almost at the same height, which was supposed to create visibility between them. However, there are questions regarding their distance and visibility under different weather conditions (table). Here the results of the analysis show that object No.15, like object No.14, was visible from the sentinel "towers" (figure 2, 1-2). The results obtained during the analysis confirm the conclusions made during archaeological exploration. Sentinel Karaultobes, either on the sidelines or along the chain, served as an intermediate signal point.

Karaultobe location table

Northern chain				
№	Name of a monument	Distance to the next monument (in meters, excluding visibility under different weather conditions)	Visible from the next monument (this table does not consider the height of the structure, but the surface where it is located)	Higher than the previous monument
15	Mashat Karaultobe	6250	yes	–
14	Karabulak Karaultobe	18943	no	no
1	Akkoyly-1 Karaultobe	13230	yes	no
17	Chubarovka-2 Karaultobe	7219	yes	no
16	Chubarovka-1 Karaultobe	10989	yes	yes
19	Koltogan Karaultobe	19406	yes	yes
20	Akdala Karaultobe	14361	no	no
21	Darmino Karaultobe	–	–	no
Southern chain				
39	Sayram-1 Karaultobe	8317	yes	–
42	Karatas-2 Karaultobe	2554	yes	yes
41	Karatas-1 Karaultobe	4437	no	no
47	Badam-3 Karaultobe	8585	yes	no
46	Badam-2 Karaultobe	6511	yes	no
45	Badam-1 Karaultobe	9719	yes	no
26	Shymkent Karaultobe		–	no

The basic Akkoyly Karaultobe (No.1) was poorly viewed from the neighboring object No.17 - Chubarovka-2 Karaultobe. During a visual inspection during archaeological exploration, elevation No.1 was viewed from five objects of the Karaultobe sentinels, which was confirmed by the analysis (figure 2, 3). Here it should be noted that the analysis shows a potential place for the location of the base or sentinel signal point between facilities No.1 and No.17 along the left bank of the Arys River. An analysis of the landscape with the help of ArcGIS indicates a strategically profitable area for the construction of a watchtower.

In the next case, the situation changes and it turns out that the potential place for Karaultobe, which would see object No.1, no longer sees object No.17 (figure 2, 4). An additional analysis of the terrain landscape was also carried out, while visibility from the nearest settlements was checked. Early medieval monuments Kultobe and Kostobe-1 are located on the left bank of Arys. From Kultobe and Kostobe-1, 5 km to the east, the aforementioned Karaultobe Akkoyly-1 is located. This Karaultobe is basic in purpose and has a large size, predominates on the ground. Akkoyly-1 Karaultobe is located on the steep slope, which allows you to control movements along the valley to the north by dozens of kilometers.

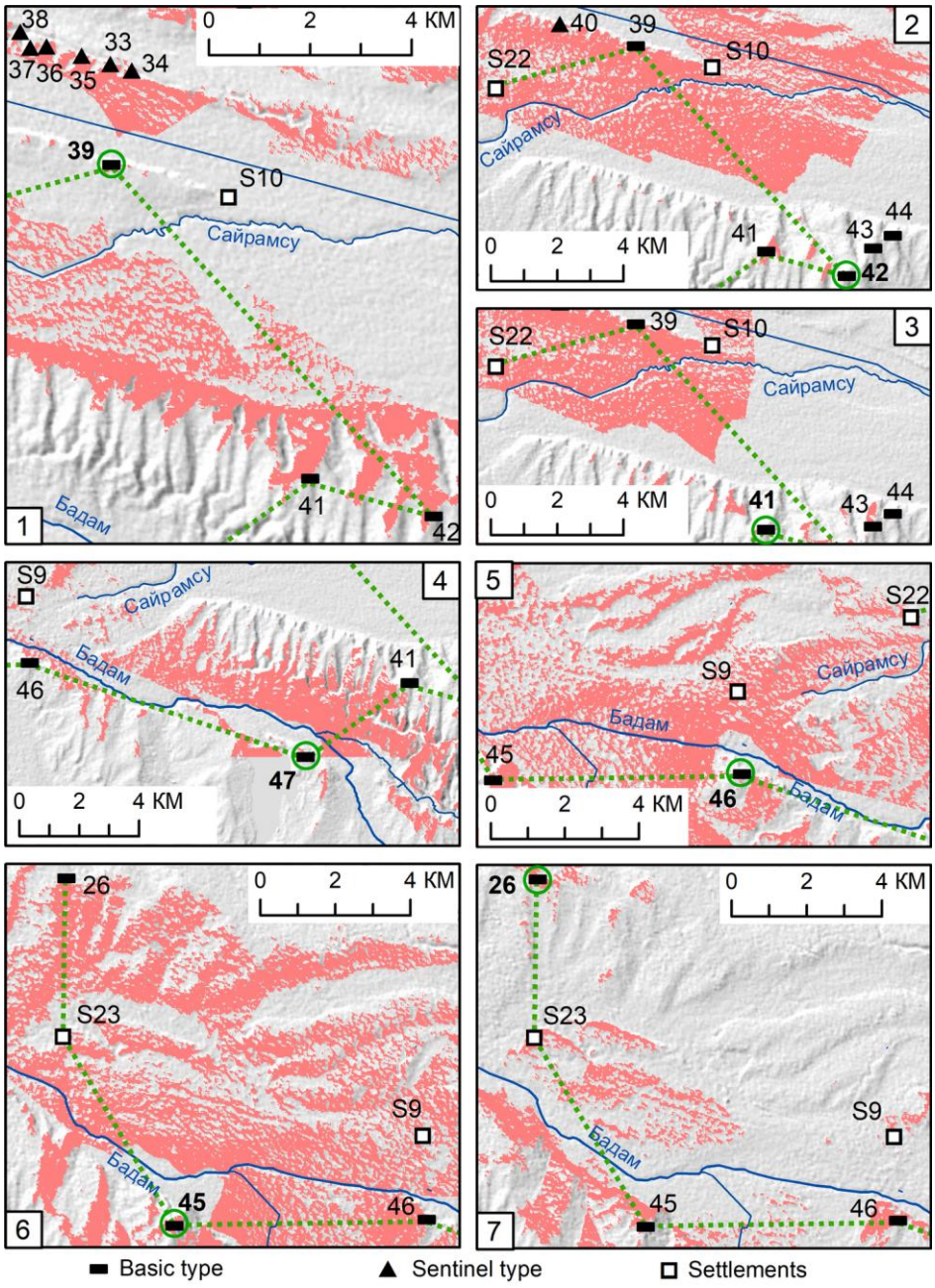

Figure 3 – Results of landscape analysis in the ArcGIS environment (Southern chain).
In red, visibility from different positions of a certain Karaultobe is shown:
1 - Sayram-1 (39); 2 - Karatas-2 (42); 3 - Karatas-1 (41); 4 - Badam-3 (47);
5 - Badam-2 (46); 6 - Badam-1 (45); 7 - Shymkent (26)

The basic facilities of Chubarovka-1 Karaultobe (No.16) and Koltogan (No.19) (figure 4), being in a rather flat and high terrain, were a strategic place where such object could be located, since from this point appears rather good view of the adjacent territory. Judging by the analysis, object No.16 was viewed from almost all positions where the neighboring Karaultobes were located (figure 2, 5-6). This is confirmed visually, that is, these two objects dominate the terrain, and they are higher than neighboring basic objects (table 1).

Following the data received, it becomes clear that at the Chubarovskoe town, which had a fortified structure, as well as at the Chubarovskoe settlement on the left bank of the Arys River, at the confluence of the small Shubarsu River, there was a direct connection with the basic Karaultobe in the oasis. 4 km south of the Chubarovskoe town and 5 km south of the Chubarovskoe settlement is the

aforementioned basic Chubarovka-1 Karaultobe. In the Middle Ages, from Chubarovka-1 Karaultobe, significant territories around it were visible for several kilometers, primarily approaches to the town and settlement in the valley were controlled. Also, from Chubarovka-1 Karaultobe, Koltogan Karaultobe, which is located 11 km to the west, is very clearly visible.

Figure 4 – Basic "watchtower" - Koltogan Karaultobe

The following objects in the northern chain are Akdala Karaultobe (No.20) and Darmino (No.21). According to the landscape analysis, object No.21 does not have a view towards the previous object, also from object No.20 there is no visibility relative to object No.21. Based on this, a test analysis (the results of which can be considered conditional) was carried out to obtain additional data, at which the estimated height of the structures themselves was added to the points under investigation. To avoid maximum inaccuracy, the data added for the height analysis were taken from the preserved ruins of the "towers" themselves. Based on the fact that the preserved ruins of object No.20 are about 9 m, and the ruins of object No.21 are 12 m, the mutual visibility of the listed erected "towers" is not questioned. However, the strategy and method for choosing the locations of these "towers" are not entirely clear, and only assumptions can be made about their purpose.

Akdala Karaultobe is located on the left bank of the Arys River, 7 km west of the settlement of Karaspantobe. The main function of Akdala Karaultobe, apparently, was to protect and prevent the fertile valleys of the right bank of the Arys River, up to the bend of the channel in the southern part. In early medieval and medieval times, a number of settlement monuments were located here, but the settlement of Karaspantobe, one of the urban centers of the region, stands out most of all here. A very large part of the oasis around the settlement of Karaspantobe in the Middle Ages was surrounded by a long wall and was protected on the south side, but from the north and north-west beyond Arys there were large areas of grazing land that needed protection. 15 km west of Akdala Karaultobe, on the left bank of the Arys River is the aforementioned Darmino Karaultobe. This monument is also basic. Darmino Karaultobe, apparently, served as one of the connecting points between large districts.

Returning to the results of the main analysis along the southern chain, Sayram-1 Karaultobe (No.39), located along the high terrace, was chosen as the first object. The result of the landscape analysis shows that this object was well viewed from the south side, where such objects as Karatas-1 Karaultobe (No.41) and Karatas-2 (No.42) were located, in addition, the visibility area of object No.39 stretches northwest of these objects (figure 3, 1). Note that the sentinel Karaultobe, located north of object No.39, is the Kyzylsu Karaultobe complex. These sentinel Karaultobes stretched along the neighboring ridge with a ravine area

north of them, and from the base Sayram-1 Karaultobe clearly saw and controlled the valley and signals from the Kyzylsu complex. This is also confirmed by the results of archaeological exploration.

The second illustration shows that object No.42 was located at an elevation higher than the previous one (table 1) and was visible from object No.39 and from the very settlement of Sayram (S22) (figure 3, 2). The situation is the same with the next object No.41, because the two objects are located close to each other (figure 2, 3).

The next object of this chain was located southwest across the Badam River, along its right channel - Badam-3 Karaultobe (No.47). This position was viewed both from the previous object No.41 and from the next object - Badam-2 Karaultobe (No.46). The latter, in turn, was well viewed from the settlement of Karatobe (S9), which is located north of it, and even from the very settlement of Sayram (figure 3, 4-5).

A similar situation is observed in the settlement of Shymkent (S23), from where there was a good view towards Badam-1 Karaultobe (No.45) (figure 3, 6). The result of an analysis of the landscape of this area shows that during the construction of such structures the strategic elevations were chosen, where the watchtowers were located. Thus, good visibility of the entire district through the Karaultobe complex was created.

The last object in the southern chain is Shymkent Karaultobe (No.26), located north of the Shymkent settlement. As the result of the analysis shows, this object was in line of sight from the position of object No.45, despite the relatively long distance. From the settlement itself, there was also a view into the lowland and towards Shymkent Karaultobe on the crest of the elevation. These data were obtained only from the analysis of the landscape, since visually this was difficult to determine due to the dense population of the territory of the modern city.

Conclusion. Analysis of the terrain of the landscape during cartographic research and exploration made it possible to obtain new data on the visibility of Karaultobes relative to each other and settlement monuments. During the study of cartography, excavation and exploration data, an assumption is made on the chronology of the construction of the basic "watchtowers" - Karaultobe. Undoubtedly, there is a certain system of interaction between basic facilities and settlements in several areas. The basic Karaultobe was used for a long time, judging by the monuments already studied, until the late Middle Ages. Initially, they were erected on high floodplain terraces, near early medieval settlements and fortifications. Judging by the ceramics identified from Shymkent and Ordabasy Karaultobes, it dates from the 1-4 centuries AD [1, p.174-175; 6, p.23].

From almost every basic Karaultobe, the following similar monument is visible. Karaultobe, being near the monuments and along important routes, was given information about the approaching enemy in time. The result in compiling the map was the appearance of characteristics that allow remotely using GIS technologies to determine the visibility from one Karaultobe of another similar monument. These data are also supported by exploration data, but only through mapping, it became clear how certain Karaultobe operated in the general warning system in their area of location. In the future, more detailed archaeological research, along with analytics, will be able to clarify the principles and conditions for the construction of Karaultobes, studied in the framework of the "Ispijab Watchtowers" Project.

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ГЕОГРАФИЧЕСКИЕ ИНФОРМАЦИОННЫЕ СИСТЕМЫ В АРХЕОЛОГИЧЕСКОЙ КАРТОГРАФИИ ЮЖНОГО КАЗАХСТАНА

Аннотация. В статье представлены имеющиеся данные по составлению карт на основе археологических разведок с последующим привлечением современных ГИС-технологий. Перед началом работ по составлению археологических карт был сделан анализ истории появления похожих документов. Были взяты данные исследований как отечественные, так из ближнего зарубежья. Следует отметить, что нынешние технологии позволяют создавать карты с точными данными и с детальной привязкой к местности, при этом используя все имеющиеся данные: это высококачественные космические снимки, данные радаров и GPS, ортофотопланы с картами высот. Это в свою очередь даст более детальное понимание о функционировании

изучаемых памятников типа Караултобе. Для составления археологической карты была собрана база данных, состоящая из информации о Караултобе и поселенческих памятниках Испиджабского историко-культурного округа. Основные данные – результаты разведок и обследований памятников типа Караултобе. Анализ был произведен на основе экспериментальных методов в ГИС. Основа карт – это данные радаров и GPS. Для анализа в статье использовались возможности ArcGIS – специального геоинформационного программного продукта. С помощью специальных инструментов проводились обследования отдельных участков и объектов. Координаты каждого Караултобе и карта высот использовались для анализа отдельно. Сами точки – это набор данных, полученных с помощью GPS при полевых исследованиях, в частности в результате археологических разведок. Карта высот – это данные радаров высокого разрешения (30 метров) доступные на вебсайте Геологической службы США. Данные о положении башен Караултобе, полученные с помощью GPS, были скорректированы по спутниковым снимкам во избежание погрешностей. Во время работ создана такая цифровая карта, которая может быть применима для отображения данных по видимости с памятников и их работы в комплексе с поселенческими памятниками региона. Изучаемые в ходе создания археологических карт объекты типа Караултобе и городища с поселениями региона. В качестве изучаемых объектов были выбраны базовые Караултобе. Данные объекты имеют характерную трапециевидную форму и крупные размеры с большой дальностью видимости с них. Поселенческие структуры выбраны исходя из предположений о взаимодействии городищ и поселений со сторожевыми башнями. Карты созданы для работ, которые включают в себя отображение анализов исследования в виде базы данных, что позволяет в дальнейшем дополнять и корректировать все собранные сведения. Сама работа по созданию карты в рамках проекта нацелена на составление серии карт. В этой серии будут отображены основная карта, где отображены все объекты, а также отдельные, более подробные карты выделенных регионов и карты с результатами анализов ландшафта местности. В публикации авторами используются не все карты, а отдельные, уменьшенные в размерах варианты, с упрощенными аннотациями. В результате создания картографической базы по теме исследования, подготовлены не только карты, но и сравнительный анализ Караултобе. Исходя из этого, важной деталью в проведении анализа является составление таблицы с данными Караултобе. Были проанализированы несколько цепочек Караултобе и определены границы видимости между ними. Результаты анализа являются важными по причине того, что на основании полученных данных появляется возможность реконструировать отсутствующие в результате уничтожения Караултобе, воспроизвести их былую высоту. Также возможно определение способа функционирования Караултобе не только в плане визуального контакта с поселенческими памятниками, но и в виде сложной системы предупреждения.

Ключевые слова: Караултобе, сторожевые башни, картография, ГИС, топография, археология, разведки, ландшафт.

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ОҢТҮСТІК ҚАЗАҚСТАННЫҢ АРХЕОЛОГИЯЛЫҚ КАРТОГРАФИЯСЫНДАҒЫ ГЕОГРАФИЯЛЫҚ АҚПАРАТТЫҚ ЖҮЙЕЛЕР

Аннотация. Мақалада археологиялық барлау жұмыстары негізінде және заманауи геоақпараттық жүйелер технологиясын қатыстыра отырып құрастырылған карта түріндегі мағлұматтар ұсынылған. Археологиялық карталарды құрастыру жұмыстарын бастағанға дейін осыған ұқсас құжаттардың пайда болу тарихы сарапталды. Жергілікті зерттеулер нәтижесімен қоса, жақын шетел нәтижелері де қарастырылды. Қазіргі технологиялар қолда бар мәліметтерді пайдалана отырып, яғни жоғары сапалы космос суреттері, радарлар мен GPS мәліметтері, биіктік карталарын беретін ортофотопландар секілді жоғары сапалы карталар алуға мүмкіндік береді. Бұл өз кезегінде Қарауылтөбе типтес ескерткіштердің қызметі мен қалыптасуы жайлы толығырақ түсінік береді. Археологиялық картаны құрастыру барысында Испиджаб тарихи-мәдени аймағының Қарауылтөбе және қоныс-мекен типтес ескерткіштері жайлы мағлұматтар жиналған дереккөз қалыптастырылды. Басты мағлұматтар – барлау және зерттеу жұмыстарының нәтижесі. Талдау жұмыстары геоақпараттық жүйедегі эксперименталды әдістеме негізінде жүргізілді. Карталардың негізі – ол радарлар мен GPS мәліметтері. Мақалада сараптама үшін ArcGIS секілді арнайы геоақпараттық бағдарламалық өнімнің мүмкіндіктері пайдаланылды. Арнайы құралдар арқылы бөлек аумақтар мен нысандар зерттелді. Сараптамаға әрбір қарауылтөбе координаттары мен биіктік картасы жеке пайдаланылды. Нүктелердің өзі – археологиялық барлау жұмыстары барысында GPS құрылғысы арқылы алынған мәліметтердің жиынтығы. Биіктік картасы – АҚШ-тың Геологиялық қызметінің вебсайтында бар жоғары сапалы (30 метр) радарлардың мәліметтері. GPS құрылғысы арқылы алынған Қарауылтөбенің орналасуы жайлы мәліметтер қателік жібермеу мақсатында спутникті суреттер арқылы түзетілді. Жұмыс барысында ескерткіштерден көз көрерлік

аумақ пен олардың қоныс-мекендермен кешенді байланысын бейнелейтін цифрлы карта құрастырылды. Археологиялық карталарды құру барысында зерттелген нысандар – Қарауылтөбе типтес ескерткіштер мен осы аймақтағы қалашық, елдімекендер. Зерттеу нысаны ретінде негізгі қарауылтөбелер таңдалды. Бұл нысандар өзіндік бір трапеция тәріздес пішімі бар ірі көлемді болып келген. Елдімекен құрылымдас ескерткіштер осы қарауыл мұнараларымен әрекеттестік болу мүмкіндігі қарастырыла отырып таңдалды. Аталмыш карталар барлық жиналған мәліметтерді алдағы уақытта толықтыруға және түзетуге мүмкіндік беретін дереккөз ретінде құрастырылған. Жоба аясындағы карта құрастыру жұмыстары, жалпы бірнеше карталар топтамасын жасауға бағытталған. Бұл топтамада барлық нысандар енгізілген басты карта және де бөлек аймақтар бойынша егжей-тегжейлі карталар, сол сияқты төңіректің ландшафты бойынша талдау жұмыстарының нәтижесі топтастырылған карталар. Мақалада авторлар барлық карталарды емес, тек басты, көлемі кішірейтілген, мазмұны жеңілдетілген карталарды пайдаланды. Сонымен, зерттеу тақырыбы бойынша картографиялық база құру жұмыстарының нәтижесінде тек карта құрастырылып қана қоймай, сонымен қатар қарауылтөбелер салыстырмалы талданды. Осыдан шыға, талдау жасау барысында басты бөлік ретінде Қарауылтөбе жайлы мәліметтер жұмылдырылған кесте түзу болды. Бірнеше қарауылтөбелердің тізбекшесі талданып, олардың арасындағы көріну-көрінбеу мүмкіншіліктері анықталды. Жүргізілген талдаудың маңыздылығы алынған мәліметтер негізінде олардың жойылып кеткен нүктелерін реконструкция жасай отырып, олардың сол замандағы биіктігін болжай алуында. Сол сияқты қарауылтөбелер елдімекендермен жай ғана байланыс ретінде емес, оларды күрделі ескерту жүйесі ретінде қарастыруға мүмкіншілік пайда болды.

Түйін сөздер: Қарауылтөбе, қарауыл мұнаралары, картография, геоақпараттық жүйелер, топография, археология, барлау, ландшафт.

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KAZAKHSTAN GERMANS: TRAGICAL PAGES OF HISTORY

Abstract. At present, the peoples of Kazakhstan, as well as the entire post-Soviet space are undergoing spiritual awakening and a return to traditional sources. It is important that the processes of searching for national identity are a universal historical and sociocultural tendency of the modern world. In domestic historical science for a long time there has been a steady interest in the formation of the multi-ethnic composition of the population of history. One of the representatives are Germans. Deportation, as a large-scale action of the state to some peoples inhabiting its territory, including Germans, as a phenomenon of recent history, the consequences of which are tangible to this day should be analyzed and evaluated from the point of view of not only historical-political, moral, but also legal criteria. Based on archival documents and materials, for the concept of Stalinist stereotypes caused primarily by understanding the causes, main trends, scale, consequences of the government's repressive measures against the Germans of Kazakhstan. The study of the economic structure and labor mobilization of the Germans allows us to trace the role of special settlers in creating a powerful industrial potential of the country in remote areas with severe climatic conditions. And of particular interest is the question of the work of state authorities to create the living conditions of special German resettlers in special settlements, the problems of the legal status of special resettlers, the removal of restrictions on legal provisions, the repatriation of Germans.

Key words: deportation, special settlers, NKVD, resettlement, liquidation, household management, labor mobilization, legal status, repatriation.

The relevance of the topic. When the development of Kazakhstan at the present stage is aimed at increasing the well-being of citizens and improving public relations, in particular at the formation of the most significant social values which provides for the creation of the necessary social and economic conditions for the innovative development of the country, the constructive interaction of government structures with civil society institutions. The leading role is given to the formation of human capital, one of the main tasks of which is the formation of a legal state based on the observance of human rights, social and ethnic groups of the population. In modern conditions, the problem of preserving national identity against political and economic globalization, the creation of new transnational entities both within and between states, and the growth of mass migration around the world is becoming highly relevant. In particular, this applies to all modern multinational states including Kazakhstan.

Today, totalitarianism remains as a poorly researched aspect of historiographic science, it is a special socio-political phenomenon that played an ominous role in the fate of people of the Soviet era. One of the gravest crimes of totalitarianism is the deportation of peoples including Germans, as the forcible destruction of their ethno-social and territorial unity which had far-reaching negative consequences, as well as for the people in whose habitat they were introduced. The issues under consideration went through a complex and contradictory path of formation and development, experienced a long-term negative impact of the political and ideological condition. Much of what has been done before requires a serious rethinking; a number of assessments of past events need to be revised. Scientific works that unilaterally or simplistically explain past phenomena can no longer satisfy contemporaries.

Materials and methods of research. Documents and materials that reveal the history of the deportation of Germans to Kazakhstan are contained in local state and departmental archives. During the preparation of the scientific publication, the documents of the Central State Archive of the Republic of

Kazakhstan (CSA RK) fund № 1109 of the Presidium of the Supreme Council of the Kazakh SSR, fund No. 16 of the archive of the Committee on Legal Statistics and Special Accounts of the General Prosecutor's Office of the Republic of Kazakhstan (materials of the NKVD, Ministry of Internal Affairs), party funds No. 1 - Karaganda Regional Committee of the Communist Party of Kazakhstan and No.18 - Karaganda Regional Executive Committee of Workers' Deputies of the State Archives of the Karaganda Region (GAKO), as well as archival documents and materials of the Karlag Archive D.20 and D.391 - Karaganda ITL, Special Department of the USSR. During the study of the problem, the principles of historicism, scientific objectivity, and integrity were used. An objective criterion for studying this problem lies in historical facts and historical sources. Objectivity was achieved by attracting a wide range of archival documents, as well as the author's desire for an unbiased analysis of all documents used without exception relating to the object of study. In the work, specific historical and problem-chronological research methods were used, as well as statistical and descriptive methods, which allow to consistently reveal the essence of the questions being studied.

Research results. With the beginning of World War II, the Germans who lived in the Volga region were the first to be deported. A Decree of the Presidium of the Supreme Soviet of the USSR "On the abolition of the German Autonomous Region of the Volga Region" was issued, resolutions "On the Placement of Volga Germans in Kazakhstan" and "On the Relocation of Germans from Georgia, Azerbaijan and the Armenian SSR" were adopted. Almost every person of German nationality was deported: Volzhans, Muscovites, Germans from Ukraine, the Caucasus were exiled, officers and soldiers were recalled from the front. The deportation of the Germans is linked to the facts of mass sabotage and espionage, which supposedly at the signal from Germany should have taken place in areas inhabited by the Volga Germans. However, the archives did not reveal any documents testifying to "reports of the military authorities and other signals about the presence of thousands and tens of thousands of saboteurs and spies in the Volga region" who were ready on command from Germany to turn the German population of the Autonomous Soviet Socialist Republic into a "fifth colony" in the rear of the Red Army [1]. It should be noted here that the German population was simultaneously evicted from all areas of the European part of the country that were not yet occupied by opponents. And the liquidation of the Autonomous Soviet Socialist Republic of the Volga Germans was also illegal. However, the observance of such "subtleties" was not inherent in I. Stalin and his entourage. This was especially pronounced in the following years, when acts of terror were played out against other peoples living in Transcaucasia and other regions of the country.

Kazakh historian academician M.K. Kozybaev claims that from the end of the 30s Kazakhstan began to turn into a "Stalinist prison of peoples" [2]. Indeed, every fifth resident of Kazakhstan was a special settler deported for both social and political reasons. The forced relocation took place under the leadership of the NKVD.

In archival documents, the word "deportation" is generally absent. Along with "resettlement", "labor resettlement", and "special resettlement", the word "operation" is most often used which accurately reflects the meaning of the events as a chain of successive actions.

According to the historian A. Nekrich, the general management of the deportation of all peoples was carried out by L.P. Beria, a member of the Politburo of the Central Committee of the All-Union Communist Party of Bolsheviks, a member of the State Defense Committee, and the People's Commissar of Internal Affairs of the USSR. The operation was carried out by the NKVD troops. A. Nekrich concluded that the deportation of peoples during the Great Patriotic War was considered by the state as a preventive measure (Volga Germans, Kurds, Turks, Greeks), as a punitive measure (Chechens, Ingush, Balkars, Karachais, Crimean Tatars) and as a military measure -strategic nature, aimed at creating a more "reliable" layer of the border population [3]. Indeed, violent methods of deportation of peoples cannot be justified by any military or other considerations. The main accusation against the deported peoples was "full cooperation with the enemy." But such a statement was absurd, since most of the male population of these peoples was mobilized into the ranks of the Red Army.

The Germans were the largest national group of all those subjected to forced relocation. Although the history of the Germans in Kazakhstan dates to the XIX century. [4]. Overall, 1209430 Germans were resettled in 1941-1942 [5, p.42]. According to the State Archives of the Karaganda Region, 225 to

350 thousand Germans were deported to Kazakhstan. According to other sources, during the war over 420 thousand people of the German population were deported to Kazakhstan [6, p.8]. And according to the Archive of the Committee on Legal Statistics and Special Accounts of the General Prosecutor's Office of the Republic of Kazakhstan, in the "Certificate on the resettlement of German immigrants in the regions of the Kazakh SSR as of December 10, 1941 there were 34,970 people [7], and as of January 5, 1942 there were already 382,102 people [8].

Preparations to receive special German immigrants in the republic were carried out in advance. According to the Decree of the Council of People's Commissars of the Kazakh SSR and the Central Committee of the Communist Party (b) of Kazakhstan of September 1, 1941 "On measures to implement the decision of the Council of People's Commissars of the USSR" and the Central Committee of the CPSU (b) of August 26 this year "On the reception of German immigrants from the Saratov, Stalingrad regions and the Volga German Republic" in the regions of Kazakhstan, regional headquarters were created for the reception, deployment and placement of German immigrants [9, p.97]. However, regional organizations were not ready for the reception and resettlement of Germans-immigrants. The houses built for the planned migrants were transferred even before their arrival to accommodate the evacuated population from the western regions of the country. By a decree of the Council of People's Commissars of November 21, 1941, 1,677 German families were deported from the Kuibyshev Region, while another 6,000 Germans were deported from the Kalmyk ASSR [10].

It was almost impossible to complete the Center's installation to accommodate such a huge number of deported Germans in the field. The cessation of navigation on the Irtysh and the remoteness of the railways, as well as the arbitrariness of local authorities put the deported Germans on the brink of starvation and extinction. The element of crucial importance was the initiative of local residents, in whose homes for the most part they were settled in.

State policy was aimed at the deployment of German special migrants in rural areas. Thus, an attempt was made to fill the shortage of rural labor.

As the territory occupied by the Nazis was liberated, eviction of representatives of deported peoples continued. First, this again affected the German population. In 1944-1945, from the liberated territory of Ukraine, Belarus and the Baltic countries, the German population was evicted, living there since the pre-war era. All of them, although a small number, were sent for permanent residence in the regions of Siberia and Kazakhstan. By the end of 1945, about 9 thousand Germans from the western regions of the country were additionally stationed in Kazakhstan [6, p.2].

The main area of their settlement was the Northern and Central regions. The number of Germans deported to Kazakhstan during the Great Patriotic War was unstable, as most of them were mobilized into the labor army and mainly to the coal industry of Karaganda. In 1942-1943, 103733 Germans were mobilized to construction sites, in the coal, oil industry and NKVD camps, of which 92438 people left Kazakhstan including 30,403 women [11]. Moreover, the largest number of mobilized Germans accounted for the North Kazakhstan, Pavlodar and East Kazakhstan regions.

In the early years, the large group among the mobilized was the deported Germans in which male part was fully drafted into the labor army. Soon, they began to take away women due to a lack of labor as evidenced by archival documents. According to these documents, "Germans were provided with food and warm clothes for 10 days and were mobilized to the labor front as physically fit"[12]. During the Great Patriotic War, the training of skilled workers for industry and transport acquired its exceptional importance. State labor reserves from the very first days of the war were one of the forms of replenishing the working class - in this system, extensive training of qualified personnel was carried out for leading industries, transport and construction.

The mobilization of youth in the Factory-training and railway schools was carried out in such a way as the mobilization of the Labor Army based on government documents. For example, on February 27, 1943, there was a decree No. 27c of the Council of People's Commissars and the Central Committee of the Communist Party (Bolsheviks) of the Kazakh SSR "On the regular appeal of young people to Factory-training, craft and railway schools. It said, "Obligate the Republican Labor Reserves Directorates to study in the factory-training, craft and railway schools until March 1943, 12,700 people of urban, collective and other agricultural youth" [13].

Male and female youth between the ages of 15-17 and women aged 16-18 were recruited to Factory-training schools, and 14–15-year-old males with 15–16-year-old females to craft and railway schools. Along with the local population, children of special settlers were enlisted.

On July 11, 1946, the Order of the USSR Ministry of Internal Affairs No. 0205 was issued on the dismissal of civilian workers, including special settlers from the camps of the Ministry of Internal Affairs. According to this order, the previously established procedure for sending Germans and people of other nationalities, after serving the sentence, to the working columns of the labor camps of the Ministry of Internal Affairs was canceled. Now, after the convicts (USSR citizens) had served their sentence they were sent for residence Germans - to the places of resettlement of this nationality, provided for in the special directive of the GULAG and the SSD of the Ministry of Internal Affairs of the USSR. Upon delivery of documents on release to persons of nationality listed in paragraphs “a” and “c”, they were obligated by their subscription to appear in accordance with the chipboard of the Ministry of Internal Affairs - Regional Department of the Ministry of Internal Affairs for registration as special settlers [14].

As of July 1, 1944, 218328 people (71151 families) – German special settlers were registered in the republic. And by the end of the war on January 1, 1945, Germans-special settlers, according to the NKVD certificate on the presence of special settlers in the Kazakh SSR, registered 243,722 people (79,017 families) [15]. It is noteworthy that the deported Germans were not sent to the West Kazakhstan region. This is due to the fact that the actions of the state were dictated primarily by political and strategic goals and this area was adjacent to the Volga Germans Republic.

It should be noted that in the initial period of the resettlement of the Germans an unfavorable political situation was created, which was the result of their difficult financial situation. The instructions for receiving and arranging the Germans provided for the issue of livestock to them for personal use by exchange operations in exchange for the personal receipts presented by the settlers. However, as evidenced by the documents, “the vast majority of them arrived without proper clearance on the surrender of both their means of production and food to the state” [13, p.109]. The difficult financial situation caused “a revival of anti-Soviet sentiment, the spread of various rumors, defeatist agitation, and degrading work on collective farms” and in this regard, the Communist Party (b) of Kazakhstan obliges all party organizations: “to pay special attention to political work on collective farms, where Germans-immigrants are and provide political work among them ” [13, P.103-104].

In 1943-1944 the labor reserve increased with the arrival in Kazakhstan of special migrants from the North Caucasus. Labor-mobilized ones were placed in specially designated "zones" with barriers, armed guards, and shift at the gates. Above them was placed the commandant of the NKVD [16].

In the pre-war and war periods, the policy of the Soviet state was tightened and aimed at "the physical capabilities of the camp labor force to be used to the maximum in any production" [17]. This is evidenced by the Decree of the Presidium of the Supreme Soviet of the USSR "On the camps of the NKVD of the USSR" of June 5, 1939, which stipulates that, firstly, the system of conditional early release of camp contingents should be abandoned and a convict serving his sentence in the camps of the NKVD of the USSR, and must serve the term established by the court in full and offer the authorities of the Court and the Prosecutor's Office to stop investigating parole cases from the camps, also for NKVD to stop the practice of offsets of one working day for two. In order to raise the incentive to enhance labor productivity for individual manufacturers giving high rates of labor productivity, they established "monetary bonus, a facilitated camp regime with an overall improvement in their living conditions." And in relation to individual prisoners, excellent workers in production, who give high rates of labor for a long time in the camps could be released on parole but only by decision of the Board of the NKVD USSR and the Special Meeting on a request from the head of the camp and of the political department. As for truants who refuse to work and disruptors of production, severe coercive measures were applied to them: an enhanced camp regime, a punishment cell, worse living conditions, and other disciplinary measures. More severe, judicial penalties were applied to the most malicious disruptors of camp life and production, in some cases up to the highest punishment. The Decree notes that the supply of camp labor with food and industrial clothing should be such that the physical capabilities of people can be used to the maximum in any production [17, L.6].

On December 13, 1955, a Decree of the Presidium of the Supreme Soviet of the USSR "On the removal of restrictions on the legal status of Germans and members of their families who are on special settlements" was issued. This Decree was announced through Order of the USSR Ministry of Internal Affairs No. 0601 of 1955 based on the not that "restrictions are illegal and unfair, and from the fact that they are not subsequently caused by necessity." It was only about one thing - the removal of the Germans from the register of special settlements and the release of administrative bodies of the Ministry of Internal Affairs from administrative supervision. But they were specially announced on receipt, "that after release from the special settlement they can live in any point of the country, except for the area where they lived before the eviction. It was also announced that residential buildings and other premises that belonged to them prior to eviction are subject of no return" [18].

The category of special settlers was removed from the register of special settlements based on the relevant documents. It was announced after being released from the special settlement on receipt that they, can live "in any place in the country, except for the area where they lived before the eviction". They were also informed that the dwelling houses and other premises that belonged to them before the eviction were not subject to return.

Only after the debunking of the personality cult of Stalin the flywheel of the state machine stopped. Special supervision of the Germans was abolished in 1955. Within a 3-day period, local commissions were created consisting of chairmen of regional executive committees, deputy chiefs of the UNKVD, and the KGB, guidelines for sending Germans were developed [19]. The train staff was compiled to send special migrants to their former places of residence, instructions to the chief of the echelon on escorting special settlers and serving them along the line. On December 5, 1955, a train consisting of 4 passenger and one freight wagons with citizens who expressed a desire to leave for the German People's Republic was sent from Karaganda. In total, 104 adults and 47 children under 16 years of age left with this echelon. All departures were given a lump-sum cash allowance at the rate of 300 rubles per adult and 200 rubles per child [20].

Thus, the State pursued a directed policy of destroying the socio-ethnocultural foundations of the expelled peoples, which along with the disruption of clan ties, dispersed settlement over a vast territory and difficult connections, should sooner or later put them before the fact of weakening ethnic unity, associated with the danger of subsequent disappearance. This circumstance makes it possible to qualify the actions of the Soviet state in relation to repressed peoples as ethnic discrimination. The objective circumstances of life in exile created for the deported peoples the necessary set of incentives for socialization in the places of settlement. Therefore, deportation and stay in a special settlement can be considered as an integral part of the system of directive and coercive actions of the Soviet state by the country, aimed at forming a consolidated socio-cultural community of a supra-ethnic character.

Annually, on June 31, Kazakhstan marks the Day of Remembrance of the Victims of Political Repression. Representatives of the most diverse groups of the population, of all nationalities living in the republic became victims of repression. By the Decree of the President of the Republic of Kazakhstan "On declaring 1997 as the Year of National Accord and in Remembrance of the Victims of Political Repressions", a legal basis has been created for strengthening consent and commemorating the victims of the past regime. The main idea of this historical document is the deepening of the consistent course towards the consolidation of society, the final and clear condemnation of the way to resolve the national issue that was carried out during the totalitarian regime. Its main focus is the restoration of historical justice, the comprehension of national policies pursued in the conditions of the development of sovereign Kazakhstan with state support and with the broad participation of the whole people, all national groups living in the country. This is the task and the humanistic meaning of the declared Year - to pay tribute to the memory of those of our ethnic relatives who died, suffered innocent harm, and draw conclusions from the bitter lessons of the past.

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ҚАЗАҚСТАН НЕМІСТЕРІ: ТАРИХТЫҢ ҚАСІРЕТТІ БЕТТЕРІ

Аннотация. Қазіргі уақытта Қазақстан халықтары, бүкіл посткеңестік кеңістіктегідей рухани жаңғыру мен дәстүрлі түп тамырына оралуды бастан кешуде. Ұлттық бірегейлікті іздеу үрдістері қазіргі әлемдегі жалпы тарихи және әлеуметтік-мәдени тенденция болып саналады. Сондай-ақ, Қазақстан саяси қуғын-сүргін құрбаны болған миллиондаған азаматтарын мәңгі есте қалдырмайынша әлемдік қоғамдастықта құқықтық мемлекет ретінде жетекші рөлдің біріне ие бола алмайды. Осыған байланысты өткен ғасырдың 30-50 жылдарда орын алған трагедияны өз деңгейінде түсіне білу маңызды болып саналады. Өйткені ол дәстүрдің үзілуі мен мәдени тәжірибенің сабақтастығын жоғалту негізінде сипатталады. Мысал ретінде, «лагерлік экономиканы», депортацияланған халық шоғырланған Қарлаг, Степлаг, АЛЖИР және т.б. лагерлердің құрылу жағдайын қарастырса болады. Қарағанды еңбекпен түзету лагерінің адамға толу жағдайын жылдармен көрсетейік, 1931 жылдың 1 қазанында тізімдік құрам бойынша 12174 адам, 1941 жылдың 1 қаңтарында 51404 адам, ал 1950 жылдың 1 қаңтарында 54180 адамды құраған. Қамаудағылардың еңбегі тау-кен жұмыстарында, кен шахталарындағы жерасты жұмыс түрлеріне пайдаланылды.

Осылайша, тоталитарлық режим Қазақстанды алып резервке айналдырды, оған КСРО-ның түрлі өңірлерінен жүздеген мың адам жер аударылды. 1920-30 жылдары КСРО Орталық аймақтарынан айдаумен Қазақстан, Орал, Орта Азия аумағына құлатылған класс өкілдері, дінбасылар, сондай-ақ (күштеп ұжымдастыру барысында) бай шаруалар жер аударылды. Соғысқа дейінгі жылдары түрлі сылтаумен корей, ирандық, күрд және т.б. тұрақты тұратын жерлерінен қуылды. Екінші дүниежүзілік соғыс басталғанда Балтық жағалауынан, Батыс Украинадан, Батыс Белоруссиядан, Бессарабиядан «жағымсыз элементтерді» депортациялау жүргізілді. Ұлы Отан соғысы жылдарында депортацияға ұлттық-аумақтық автономияға ие болған тұтас халықтар ұшырады. Олардың басым бөлігі Қазақстанға депортацияланды. Тоталитаризмнің аса ауыр қылмыстарының бірі халықтың, оның ішінде немістердің де этностық-әлеуметтік және аумақтық бірлігін күштеп жою болып саналады. Қарастырылып отырған мәселе өте күрделі және қайшылықты саяси және идеологиялық жағдайлар әсері негізінде қиын қалыптасу жолынан өті. Бұрын жасалған көптеген маңызды еңбектер қайта қарастыруларды талап етеді. Өткеннің құбылыстарын біржақты немесе үстіртін түсіндірген ғылыми еңбектер заманауи сұраныстарды қанағаттандыра алмады. Отандық тарих ғылымында халықтың полиэтникалық құрамының тарихи қалыптасуы мәселесіне қызығушылық байқалуда.

Осылайша, депортация, мемлекет аумағын мекендейтін кейбір халықтарға, соның ішінде немістерге бағытталған ауқымды масштабты науқан ретінде тарихи-саяси және моральдық-адамгершілік, сондай-ақ заң критерийлер тұрғысынан талданып, бағалануы тиіс. Ең алдымен, Қазақстан немістеріне қатысты жүргізілген репрессиялық шаралардың себептерін, негізгі үрдістерін, ауқымын, салдарын түсіну үшін сталиндік стереотиптерді ұғыну мақсатында мұрағаттық құжаттар мен материалдар негізінде. Немістердің еңбекке жұмылдыруын, шаруашылық құрылымын зерттеу қатаң климаттық жағдай байқалатын шалғай аудандарда мемлекеттің қуатты индустриялық әлеуетін құруда арнайы қоныс аударушылар рөлін анықтауға мүмкіндік береді. Арнайы қоныс аударушы немістердің қоныс аударуына жағдай жасау жөніндегі мемлекеттік билік органдарының жұмысы, арнайы қоныс аударушылардың құқықтық мәртебесінің проблемалары, құқықтық ережелердегі шектеулерді жою, немістердің репатриациясы туралы мәселе ерекше қызығушылық тудырады.

Түйін сөздер: депортация, арнайы қоныс аударушылар, ІІХК, қоныстандыру, тарату, шаруашылық орналастыру, еңбек жұмылдыру, құқықтық мәртебе, репатриация.

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КАЗАХСТАНСКИЕ НЕМЦЫ: ТРАГИЧЕСКИЕ СТРАНИЦЫ ИСТОРИИ

Аннотация. В настоящее время народы Казахстана, как и всего постсоветского пространства, переживают духовное пробуждение и возврат к традиционным истокам. Важно, что процессы поиска национальной идентичности являются всеобщей исторической и социокультурной тенденцией современного мира. Казахстан не может называться правовым государством и занять одну из ведущих ролей в мировом

сообществе, не увековечив память многих миллионов своих граждан, ставших жертвами политических репрессий. Особенно важным в этой связи является осознание трагедии 30-50-х прошлого столетия, которая характеризуется разрывом традиций, утратой преемственности культурного опыта. Вследствие репрессий страна пережила масштабные социальные изменения. Ярким примером является функционирование «лагерной экономики», создание лагерей – Карлага, Степлага, АЛЖИРа и др. Сюда стекались заключенные – представители всех депортированных народов. Лимит наполнения Карагандинского ИТЛ прослеживается по годам, к примеру, если по списочному составу на 1 октября 1931 года значилось 12174 человека, то на 1 января 1941 года – 51404 человека, а на 1 января 1950 года – 54180 человек. Использовался труд заключенных на горнорудных работах, на подземных видах работ в рудных шахтах.

Так, тоталитарный режим превратил Казахстан в гигантскую резервацию, куда были сосланы сотни тысяч людей из разных регионов СССР. В 20–30-е годы из центральных регионов СССР в массовом порядке под конвоем на территорию Казахстана, Урала, Средней Азии были выселены представители так называемого свергнутого класса, духовенства, а также зажиточные крестьяне (в ходе насильственной коллективизации). В предвоенные годы под разными предлогами из мест постоянного проживания были выдворены корейцы, иранцы, курды и др. С началом Второй мировой войны последовала депортация «нежелательных элементов» из Прибалтики, Западной Украины, Западной Белоруссии, Бессарабии, объяснявшаяся необходимостью укрепления безопасности государства. В годы Великой Отечественной войны депортации подверглись целые народы, обладавшие национально-территориальной автономией. Основная часть из них была депортирована в Казахстан. Одним из тягчайших преступлений тоталитаризма является и депортация народов, в том числе и немцев как насильственное разрушение их этносоциального и территориального единства, имевшего далеко идущие негативные последствия, в том числе и для того народа, в привычную среду обитания которого они были внедрены. Рассматриваемая проблематика прошла сложный и противоречивый путь становления и развития, испытала многолетнее негативное воздействие политической и идеологической условии. Многое из сделанного ранее требует серьезного переосмысления, ряд оценок событий прошлого нуждается в пересмотре. Научные труды, односторонне или упрощенно объяснявшие явления прошлого, уже не могут удовлетворить современников. В отечественной исторической науке на протяжении длительного времени отмечается устойчивый интерес к формированию полиэтнического состава населения история.

Таким образом, депортация, как крупномасштабная акция государства к некоторым населяющим его территорию народам, в том числе немцам как явление недавней истории, последствия которого дают о себе знать и по сей день должна быть проанализирована и оценена с точки зрения не только историко-политических, морально-нравственных, но и юридических критериев. На основании архивных документов и материалов, для понятия сталинских стереотипов, обусловленные, прежде всего, тем, чтобы понять причины, основные тенденции, масштабы, последствия проводимых государством репрессивных мер по отношению к немцам Казахстана. Изучение хозяйственного устройства, трудовой мобилизации немцев позволяет проследить роль спецпереселенцев в создании мощного индустриального потенциала страны в отдаленных районах с суровыми климатическими условиями. И особый интерес представляет вопрос о работе государственных органов власти по созданию условий жизнедеятельности спецпереселенцев-немцев на спецпоселениях, проблемы правового статуса спецпереселенцев, снятия ограничений в правовом положении, репатриация немцев для понимания характера и механизма репрессии.

Ключевые слова: депортация, спецпереселенцы, НКВД, расселение, ликвидация, хозустройство, трудовая мобилизация, правовой статус, репатриация.

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INVESTMENT POTENTIAL OF THE INSURANCE SECTOR IN KAZAKHSTAN

Abstract. The article presents the results of a study of investment opportunities of insurance companies in Kazakhstan to Finance the economy. The reasons for the insignificant investment potential of the Kazakh insurance sector, due to insufficient development of the insurance market, low level of equity of insurance organizations, are identified. It is necessary to reorient the investment strategy of insurance companies to Finance the national economy, which will have a positive impact on economic growth. Based on the analysis of the investment portfolio of insurance companies, it is concluded that there are high risks in the investment sphere, a lack of attractive investment projects and instruments, a limited list of securities for investment, and strict requirements of the regulator for financial stability. Combining a group of factors that affect the investment activity of insurance companies, as well as a SWOT analysis of the investment potential of the insurance sector, allowed us to formulate certain proposals for further improving the investment strategy of insurance companies, considering the goals of sustainable development of the financial system of Kazakhstan. The important role of state support for insurance organizations that make long-term investments in real sector enterprises is determined. The procedure for determining insurance companies that are actively investing in the innovative sector can be based on the application of coefficient analysis of investment investments of insurance companies. In addition, it is necessary to review the standards for the diversification of assets of insurance organizations with the development of unified rules for the placement of funds of insurance companies that restrict investment in the sphere of the national economy. The purpose of such regulations is to direct investment resources in the production sector, which must be developed in specific regions and in a specific time period.

Key words: insurance companies, investment, investment portfolio, asset diversification standards, regulation of investment activity.

Introduction. Currently, the activation of investment processes in the country is of particular importance in the development of the Kazakh economy, where a significant role can be played by the insurance sector, the potential of which is still not in full demand, even taking into account a fairly large amount of investment resources of insurance companies.

The investment potential of insurance companies, formed from insurance premiums of policyholders, has a powerful stabilizing effect on the economy and the stock market. In this regard, the priority task of the state's investment policy is the effective placement of these resources in the country's economy in compliance with the principles of returnability and profitability. Insurance companies are also interested in making the most effective use of insurance reserves to increase their own capitalization and asset growth.

The experience of developed countries testifies to the leading role of insurance companies in investment processes. In 2018, the amount of insurance premiums collected by all insurers in the world exceeded 5 trillion us dollars [1].

The total investment potential of insurance companies in developed countries is comparable to the investment potential of the banking sector, so they are considered serious competitors of credit institutions. For example, in the United States and the European Union, the insurance business plays a major role in long-term industry financing. In Germany, capital investments of insurance institutions

account for 25% of all investments in the economy, and their income forms more than 1/5 of the gross income of insurers and plays an important role in their activities. In the United States, the practice of providing investment loans to industrial corporations by insurance organizations for a period of 15-20 years has become widespread. [2, p. 61-66]. At the same time, insurance companies and commercial banks often provide loans together: banks Finance the project for the first 5 years, and insurers – for the next 10-15 years. When issuing large loans, insurance companies create consortia with each other or together with commercial banks in order to reduce risks.

The significant role of insurance companies in the economy of developed countries is due to the significant investment opportunities of insurers, in addition, the high level of development of the financial and credit system gives them a wide range of areas for investment. As a result, investments occupy the main share in the assets of insurance organizations, and investment income acts as the main source of profit for foreign insurers.

Materials and methods. Theoretical and methodological base of research were works of Kazakhstani and foreign scientists-economists in the field of financial support of the national economy, normative legal acts of the Republic of Kazakhstan in the sphere of development of real sector and financial system, the Concept of financial sector development until 2030, the standards for diversification of assets of insurance organizations of Kazakhstan and limits of placement of funds of insurance companies in financial instruments. In the course of the research, General scientific methods were used: the method of comparative and dynamic analysis, system-structural and cause-effect analysis, SWOT analysis of investment activities of Kazakhstan insurance companies, as well as the method of analyzing investment investments of insurance companies in the real sector of the economy using the coefficient method. The study was made by the statistics Committee on statistics of MNE of RK, the National Bank of Kazakhstan for 2015-2019, analytical reports and researches of the insurance sector, the report "World insurance: the great east pilot countries" log Sigma in 2018.

Results. The assessment of the investment potential of the Kazakhstan insurance market allows us to conclude that there is a significant gap in the investment opportunities of Kazakhstan insurance organizations. This is due to the low level of their capitalization and insufficient development of the insurance market. In summary, these conclusions are confirmed by comparing specific indicators and indicators of the insurance market, such as the total insurance premium, the level of penetration of insurance in the economy, and the density of insurance.

According to the report "World insurance: the great pilot east countries" of Sigma magazine in 2018, the volume of insurance premiums in Kazakhstan in dollar terms amounted to 1.01 billion dollars against 1469.37 billion dollars in the United States, 336.51 billion dollars in the United Kingdom, 440.65 billion dollars in Japan, 23.59 billion dollars in the Russian Federation [3]. At the same time, Kazakhstan's share in the global insurance market by the level of total insurance premiums in 2018 was 0.02% (table 1), which is comparable to the level of insurance premiums in Cyprus, Sri Lanka, Serbia, Oman.

Table 1 – Insurance premiums in individual countries and their share in the global insurance market

A country	Insurance premiums in 2017, USD billion	Insurance premiums in 2018, USD billion	Change for 2018 (%)	Share in the global insurance market, %	Insurance density: insurance premiums per capita, USD/person	Share of insurance premiums in GDP, %
Kazakhstan	1,01	1,01	0,0	0,02	55	0,63
USA	1399,22	1469,37	5,0	28,29	4481	7,14
Great Britain	319,99	336,51	5,2	6,48	4503	10,61
Germany	227,17	241,48	6,3	4,65	2908	6,03
Japan	242,45	440,65	3,8	8,49	3466	8,86
Russia	21,89	23,59	7,7	0,45	164	1,53
Taiwan	117,49	121,91	3,8	2,35	5161	20,88
Note-based on report data «World insurance: the great pilot east countries» [3]						

The insurance density index, which characterizes the amount of insurance premiums per capita, in 2018 in Kazakhstan reached the level of $ 55/person, which is 3 times less than in Russia and incomparably low in comparison with developed countries. You can compare the density of insurance in Kazakhstan, for example, with the Philippines, Sri Lanka, and Guatemala. Due to the fact that the density of insurance reflects the degree of development of insurance in the country and the level of population demand for insurance services, we can note the low interest of the population of Kazakhstan in insurance and the insignificant role of insurance companies in the socio-economic sphere.

The degree of insurance penetration into the economy in Kazakhstan is also at a very low level – in 2018, the share of insurance premiums in the country's GDP was only 0.63%. Globally, the highest degree of insurance penetration is observed in Taiwan, where the share of insurance premiums in GDP in 2018 was 20.88%. For comparison, the share of insurance premiums in the GDP of the UK in 2018 was 10.61%, the US-7.14%, Canada-7.48%, Japan-8.86%, China-4.22%.

Examining the indicators of the national insurance sector of Kazakhstan for the period 2011-2019. according to the national Bank of Kazakhstan, it is possible to note the growth of total assets to 1206 billion tenge, receipts of insurance premiums to 508.5 billion tenge and income from insurance activities to 399.4 billion tenge. However, the domestic insurance business in recent years has been characterized by a low level of investment profitability. Table 2 shows the indicators that characterize the role of the insurance sector in the economy of the Republic of Kazakhstan.

Table 2 – Dynamics of relative indicators of the insurance sector of the Republic of Kazakhstan

Indicators	01.01. 2015	01.01. 2016	01.01. 2017	01.01. 2018	01.01. 2019	01.01. 2020	Change (+,-)
GDP, billion tenge	38624,4	41307,6	46971,2	51566,8	58785,7	61819,5	+23195,1
The ratio of insurance companies ' assets to GDP, in %	**1,59**	**2,02**	**1,82**	**1,74**	**1,78**	**1,95**	0,36
The ratio of insurance companies ' equity to GDP, in %	0,74	0,99	0,85	0,77	0,80	0,90	0,16
Ratio of insurance premiums to GDP, in %	0,69	0,70	0,76	0,70	0,63	0,82	0,13
Note – calculated on the basis of statistical data of the NBRK [4]							

The results of the analysis of the data presented in table 2 show that the assets of the insurance sector as a percentage of GDP do not exceed 2%, while in a number of advanced Western countries the share of insurance premiums in GDP varies from 8 to 14% [5, p.43-52]. The low share of insurance receipts in GDP indicates the slow development of Kazakhstan's insurance market and its insignificant impact on the country's economy.

In addition, insufficient capitalization of Kazakh insurance companies discourages the development of their investment activities. The amount of equity capital of domestic insurers, despite the constant growth dynamics, is less than 1% of GDP or 553 billion tenge. It should be noted that the equity capital of one of the largest insurance companies in Kazakhstan IC "Eurasia" at the end of the 1st half of 2019 amounted to 140 billion tenge (about 365 million us dollars) [6]. While the capitalization of the American insurance company Berkshire Hathaway in 2017 was 453.2 billion dollars. China's Ping An Insurance – 186.7 billion us dollars, Germany's Allianz-103.8 billion us dollars [7].

Therefore, in order to expand the possibility of using the assets of the insurance sector as a source of investment resources, it is necessary to increase the equity of Kazakhstani insurance companies. In this regard, the opportunities of the pension sector to invest in the economy are more significant. The adoption of measures aimed at the further growth of capitalization of insurance organizations marked one of the major problems of insurance market development in the «Concept of financial sector development until 2030» [8].

In order to identify priority areas for investment in the assets of the insurance sector in Kazakhstan, the structure of the investment portfolio of insurance companies for the period 2015-2018 was analyzed. In accordance with the structure of the total investment portfolio of insurance companies, the largest share falls on securities, including government securities, their share in the portfolio is 51.9% [9]. The current

value of securities amounted to 543.8 billion tenge as of 01.01.2019. In second place in terms of invested assets of the insurance sector are deposits in banks – 18.2%, the current value of which was 190.4 billion tenge. During the period 2016-2018, insurance companies ' investments in reverse REPO operations increased. Their share in the total investment portfolio of the insurance sector reached 6.8% (71 billion tenge as of 01.01.2019).

Investments of insurance companies in the economy of Kazakhstan are made mainly through the purchase of securities on the Kazakhstan stock exchange. Therefore, the problem of transforming insurance reserves into the real sector of the economy is largely due to the weak development of the stock market. It should also be noted that the investment attractiveness of the set of investment instruments is low, which is caused by «the lack of reliable investment companies, an extremely complex risk structure, their poor predictability, and the lack of adequate experience of insurers to assess the market situation when dealing with investment of insurance reserves» [10, p.109-114].

The investment activity of insurance companies is significantly influenced by their specialization. In the structure of financial investments of companies engaged in life insurance, the predominant share is occupied by long - term instruments, and in the structure of investments of companies engaged in other types of insurance-short-term. Further development of long-term life insurance in Kazakhstan will create huge potential resources through the transformation of the population's savings into long-term investments. It should be noted that in the world practice, favorable conditions have been created for the intensive growth of life insurance. Thus, in France, serious tax benefits are provided for life insurance, the transfer of money to heirs without inheritance tax. In Germany, insurance services have the traditional character of mixed life insurance contracts that guarantee 100% coverage in the event of survival or death [11].

Along with this, as foreign experience shows, insurance companies in European countries actively practice issuing loans [12]. In Kazakhstan, insurance companies licensed under the "life insurance" class can also issue loans. However, the share of this instrument in the investment portfolio of insurance companies was less than 0.1% (or 332 million tenge) at the end of 2018. Therefore, it is possible to expand the investment opportunities of life insurance companies by liberalizing the requirements for investing assets in long-term financial instruments, using life insurance policies as collateral in mortgage lending, changing the taxation procedure in terms of exemption from taxation of insurance payments and canceling existing tax incentives for insurance premiums (contributions).

State regulation has a significant impact on the investment activity of financial organizations [13]. The regulatory role of the state, on the one hand, is aimed at ensuring that insurers comply with the principles of repayment, diversification, profitability and liquidity, and on the other hand, at orienting the investment resources of insurance companies in the economy. This optimal regulation by the state ensures the sustainable development of the insurance market and creates favorable conditions for the flow of investment resources of insurance companies into the country's economy.

Kazakhstan has a number of standards that are mandatory for insurance (reinsurance) organizations [14]. However, the analysis of the list of financial instruments that are recognized as highly liquid assets of insurance companies shows their low investment attractiveness. The existing requirements for ratings of Kazakhstani issuers, in whose securities the assets of the insurance sector can be invested, are regulated quite strictly, which limits the ability of insurance companies to participate in investing in the economy of Kazakhstan. In many countries with developed market economies, "... the rules of investment activity are subject to the requirements of investing funds in the national economy" [12]. It is possible that the establishment of a lower limit in Kazakhstan on the volume of invested funds of insurance companies in securities of enterprises in the innovation sector will help attract long-term resources of the insurance market to this area. The current situation requires a reorientation to the use of a macro-economic approach in regulating the insurance market, focused on establishing priority areas and objects of investment in the insurance sector's assets, supported by tax incentives, state guarantees, etc.

Thus, the results of the analysis allow us to distinguish two groups of factors that affect the investment activity of insurance companies: external and internal. A comprehensive analysis of the degree of influence of these factors on the investment activity of insurance companies will allow assessing the prospects for the development of the insurance sector in the context of state macroeconomic policy [15].

Based on the identified factors, it is possible to systematize and generalize the following main problems of the insurance sector related to the investment of its assets in the economy of Kazakhstan. The investment potential of insurance companies in Kazakhstan remains insignificant, as evidenced by the ratio of insurance sector assets to GDP, which does not exceed 1.95% of GDP. In addition, the existing stock market is characterized by the monotony of available instruments, their low yield, which does not provide protection from inflation, and a limited number of reliable borrowers and issuers. Therefore, there are not enough financial instruments in which insurance companies can place their assets in a long-term, low-risk and profitable manner. However, small amounts of investment by Kazakh insurance companies in the economy are associated not only with the low investment attractiveness of investment instruments and the lack of state guarantee mechanisms, but also with the inability of many insurers to optimally form their investment potential.

Based on the study of investment activity of Kazakhstan insurance companies, its SWOT analysis was conducted (table 3).

Table 3 – SWOT analysis of insurance companies investing in the innovative sector of Kazakhstan

Weakness	Strength
- weak investment potential of the insurance sector; - insignificant share of Kazakhstan's insurance sector in the global insurance market; - regulations for diversification of insurance companies ' assets limit their investment opportunities; - low diversification of the investment portfolio of insurance companies; - weak development of long-term types of insurance; - high risks of investing in the innovation sector; - limited number of investment instruments on the stock exchange	- annual growth of total insurance sector assets; - increasing the stability of insurance companies, switching to risk-based supervision; - a system for guaranteeing insurance payments has been created; - developed a Concept for the development of the financial sector until 2030, including the insurance market; - significant excess of assets of the insurance sector over insurance payments; - positive profitability of insurance companies; - there has been a dynamic growth in the life insurance industry
Threats	**Opportunities**
- tightening of state regulation of the insurance sector, reducing the number of insurance companies; - decrease in the yield of investment instruments due to lower rates on the money market; - macroeconomic instability, increased risks; - stricter conditions for admission to the stock exchange for innovative companies ' securities; - lack of positive effect of state programs for the development of the insurance market	- the growth of equity capital will help to increase the size of insurance companies and enhance their investment activities; - liberalizing requirements for investment of insurance companies ' assets; - expansion of credit activities of life insurance companies; - improvement of state guarantee mechanisms in the insurance sector; - appearance of new investment instruments on the stock market; - increasing the investment potential of insurance companies through the development of new insurance products and services

To effectively use the investment opportunities of Kazakhstan's insurance companies, it is necessary to form an appropriate state investment policy in relation to the insurance market, which contributes to increasing its investment potential and takes into account the country's investment priorities. One of the measures to increase the investment potential of the insurance sector is to encourage the development of life insurance as a source of long-term financial resources. Tax incentives are particularly important here.

Discussion. The reorientation of the investment policy of insurance companies to the needs of the national economy also largely depends on support from the state. The priority direction of investment in the innovative sector should be determined by the state within the framework of the state program of investment policy with the participation of investment resources of insurance companies, which should provide financial support to those insurers that make a significant contribution to the development of processing industries, including tax incentives. The procedure for determining insurance companies that are actively investing in the real sector can be based on the application of the Methodology for analyzing investment investments of insurance companies using the following coefficients (table 4):

Table 4 – Coefficients for analyzing insurance companies ' investment investments

The name of the coefficient	Calculation formula	Indicators
investment activity coefficient-reflects the share of investments in the value of the insurance company's assets	$K_1 = \frac{I_к}{A_k}$	where I_k - total investment of the insurance company A_k - asset of the insurance company's balance sheet for the reporting period.
coefficient of return on financial investments in the real sector, which reflects the profitability of the insurance company's financial investments in the real sector	$K_2 = \frac{P_s}{R_s}$	where P_s - income received from investing in the real sector; R_s - amount of funds invested in the real sector
the ratio of the share of investment in the innovation sector to the total capital	$K_3 = \frac{A_s}{E_s}$	where A_s - insurance company funds invested in the innovation sector; E_s - Total capital of the insurance company for the period.
the coefficient of efficiency of investments in the real sector, which reflects the change in the return on total capital of the insurance company, which may occur as a result of investment in the real sector	$K_4 = K_3 \times (K_2 - K_e) \times 100$	where K_e - Return on investment in the innovation sector
Note: compiled by the authors based on data [16]		

The use of these coefficients will reveal the activity of each insurance company in investing in the innovation sector and the effectiveness of such investments.

It is worth noting the experience of the European Union, where unified rules for placing funds of insurance companies have been established, limiting investment to the sphere of the national economy. The purpose of such regulations is to direct investment resources in the production sector, which must be developed in specific regions and in a specific time period. In the United States, insurance companies provide industrial corporations with investment loans for a period of 15-20 years. Regulations have also been developed to encourage insurance companies to invest in priority sectors of the economy [11].

In addition, in most OECD countries, investment regulations do not apply to the investment of insurance companies ' own funds. In these countries, regulations only regulate the investment of funds that constitute contractual obligations to policyholders [17, p. 21-25]. Insurance companies can place their own capital at their discretion, which is one of the incentives to maintain its level above the established minimums. Therefore, the regulatory documents regulating the investment of funds of insurance organizations in our country should also exclude restrictions on the investment of their own capital.

Conclusion. Currently, in many countries, the regulation of investment activities of insurance companies is undergoing drastic changes, as the introduction of risk-based capital regimes significantly affects the ability and desire of insurers to make long-term investments. The OECD studies note that investments in long-term projects lead to higher capital requirements for insurance companies and their solvency [18]. In this regard, the experience of Switzerland is interesting, where in applying a risk-based regime, it is possible to apply supervision at your discretion, allowing you to invest in certain long-term assets in each case. The law on insurance supervision in Switzerland has been amended to allow insurers to qualify as related assets certain assets that do not technically qualify for this status [19].

Liberalization of investment regulation of insurance companies by the state, which can become a serious driver for the development of both the insurance business and investment processes in the economy. The solution to the problem of lack of investment instruments is seen in the creation of special government securities aimed at insurance companies. These can be targeted long-term government bonds that reduce investment risk and increase the investment attractiveness of the real sector. The financial resources concentrated through the placement of such bonds could be used as long-term investments in the development of the innovation sector. It should be noted that such a tool is used in the European Union. In 2013, the European Commission developed the regulation on European long-term investment funds (ELTIF), which acts as a new type of (alternative investment) funds that focuses on investing in long-term assets, in particular infrastructure projects [20]. Organizing the issue of special securities will, of course, require a whole range of measures, including the development of tax incentives and security guarantees. However, as a result of the implementation of this offer to issue special securities in Kazakhstan, positive effects will be achieved.

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ҚАЗАҚСТАННЫҢ САҚТАНДЫРУ СЕКТОРЫНЫҢ ИНВЕСТИЦИЯЛЫҚ ӘЛЕУЕТІ

Аннотация. Мақалада экономиканы қаржыландыру үшін Қазақстанның сақтандыру компанияларының инвестициялық мүмкіндіктерін зерттеу нәтижелері берілген. Сақтандыру нарығының жеткіліксіз дамуына, сақтандыру ұйымдарының меншікті капиталының төмен деңгейіне байланысты қазақстандық сақтандыру секторының инвестициялық әлеуетінің елеулі емес себептері анықталды. Сақтандыру компанияларының инвестициялық стратегиясын ұлттық экономиканы қаржыландыруға қайта бағдарлау қажет, бұл экономикалық өсуге оң әсер етеді. Сақтандыру компанияларының инвестициялық портфелін талдау негізінде инвестициялық салада жоғары тәуекелдердің болуы, тартымды инвестициялық жобалар мен құралдардың жетіспеушілігі, инвестицияларды салуға арналған бағалы қағаздардың шектеулі тізбесі, реттеуіштің қаржылық тұрақтылыққа қатаң талаптары туралы қорытынды жасалды. Сақтандыру компанияларының инвестициялық қызметіне әсер ететін факторлар тобын біріктіру, сондай-ақ сақтандыру секторының инвестициялық әлеуетін SWOT-талдау Қазақстанның қаржы жүйесінің тұрақты даму мақсаттарын ескере отырып, сақтандыру компанияларының инвестициялық стратегиясын одан әрі жетілдіру бойынша белгілі бір ұсыныстарды тұжырымдауға мүмкіндік берді. Нақты сектор кәсіпорындарына ұзақ мерзімді инвестицияларды жүзеге асыратын сақтандыру ұйымдарын мемлекеттік қолдаудың маңызды рөлі айқындалған. Инновациялық секторға белсенді инвестициялайтын сақтандыру компанияларын айқындау рәсімі сақтандыру компанияларының инвестициялық салымдарын коэффициенттік талдауды қолдануға негізделуі мүмкін. Бұдан басқа, ұлттық экономика саласындағы инвестицияларды шектейтін сақтандыру компанияларының қаражатын орналастырудың біріздендірілген нормаларын әзірлей отырып, сақтандыру ұйымдарының активтерін әртараптандыру нормативтерін қайта қарау қажет. Мұндай нормативтердің мақсаты нақты өңірлерде және нақты уақыт кезеңінде дамытылуы қажет өндіріс саласына инвестициялық ресурстарды бағыттау болып табылады. Сақтандыру компанияларын экономиканың нақты секторы инвестицияларды ұлғайтуды ынталандыратын шара ретінде ұлттық экономиканы дамыту басымдықтарына сәйкес сақтандырушылардың ресурстарын нақты салаларға жіберу үшін сақтандыру ұйымдарының активтерін әртараптандыру нормативтерін қайта қарау және нақтылау ұсынылады. Ұзақ мерзімді сақтандыруды кеңейту мақсатында сақтандыру төлемдеріне кепілдік беру тетігін қайта қарау қажет. Өмірді ерікті сақтандыру бойынша сақтандыру төлемдеріне кепілдік беруді енгізу осы сақтандыру өнімдерінің тартымдылығын арттырады,халықтың ұзақ мерзімді сақтандыруға деген сенімін қайтарады. Сақтандыру төлемдеріне кепілдік беру жүйесі жеке тұлғалардың салымдарына (депозиттеріне) кепілдік беру жүйесіне ұқсас, атап айтқанда жинақтаушы сақтандыру үшін құрылуы мүмкін. Сақтандыру компаниялары тарапынан халық үшін тартымды жаңа сақтандыру өнімдері мен жинақтаушы сақтандыру қызметтерін әзірлеу қажет.

Түйін сөздер: сақтандыру компаниялары, инвестициялық портфель, активтерді әртараптандыру нормативтері, инвестициялық қызметті реттеу, инвестициялау.

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ИНВЕСТИЦИОННЫЙ ПОТЕНЦИАЛ СТРАХОВОГО СЕКТОРА КАЗАХСТАНА

Аннотация. В статье представлены результаты исследования инвестиционных возможностей страховых компаний Казахстана для финансирования экономики. Выявлен причины несущественного инвестиционного потенциала казахстанского страхового сектора, обусловленные недостаточным развитие страхового рынка, низким уровнем собственного капитала страховых организаций. Необходима переориентация

инвестиционной стратегии страховых компаний на финансирование национальной экономики, что окажет положительное влияние на экономический рост. На основе анализа инвестиционного портфеля страховых компаний сделан вывод о наличии высоких рисков в инвестиционной сфере, недостатке привлекательных инвестиционных проектов и инструментов, ограниченном перечне ценных бумаг для вложения инвестиций, жестких требований регулятора к финансовой устойчивости. Объединение группы факторов, влияющих на инвестиционную деятельность страховых компаний, а также SWOT-анализ инвестиционного потенциала страхового сектора позволили сформулировать определенные предложения по дальнейшему совершенствованию инвестиционной стратегии страховых компаний с учетом целей устойчивого развития финансовой системы Казахстана. Определена важная роль государственной поддержки страховых организаций, осуществляющих долгосрочные инвестиции в предприятия реального сектора. Процедура определения страховых компаний, активно инвестирующих в инновационный сектор, может быть основана на применении коэффициентного анализа инвестиционных вложений страховых компаний. Кроме того, необходим пересмотр нормативов диверсификации активов страховых организаций с разработкой унифицированных норм размещения средств страховых компаний, ограничивающих инвестиции сферой национальной экономики. Целью таких нормативов является направление инвестиционных ресурсов в отрасли производства, которые необходимо развивать в конкретных регионах и в конкретный период времени. В качестве меры, которая будет стимулировать страховые компании увеличивать инвестиции реальный сектор экономики, предлагается пересмотреть и уточнить нормативы диверсификации активов страховых организаций для направления ресурсов страховщиков в конкретные отрасли в соответствии с приоритетами развития национальной экономики. В целях расширения долгосрочного страхования необходимо пересмотреть механизм гарантирования страховых выплат. Введение гарантирования страховых выплат по добровольному страхованию жизни повысит привлекательность данных продуктов страхования, вернет доверие населения к долгосрочному страхованию. Система гарантирования страховых выплат может быть создана по аналогии с системой гарантирования вкладов (депозитов) физических лиц, в частности для накопительного страхования. Со стороны страховых компаний необходима разработка новых страховых продуктов и услуг накопительного страхования, привлекательных для населения.

Ключевые слова: страховые компании, инвестиционный портфель, нормативы диверсификации активов, регулирование инвестиционной деятельности, инвестирование.

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CURRENT INFORMATION NEEDS OF PASSENGER AND FREIGHT TRANSPORTATION ENTERPRISES IN RUSSIA

Abstract. The current business environment cannot exist without information flows. Information is an integral part of all structural processes of economic entities, regardless of the sphere of activity. Information dependence is a topical issue not only for economic entities, stakeholders, the state but also for the world in general. There is an obvious need for reliable and timely information.

There is no doubt that information is considered the most valuable asset of the twenty-first century. Information is understood as processed and systematized quantitative or qualitative data. News about economic events, environmental disasters, social unrest around the world result in adjusting the plans and strategies of entire countries and their resident companies. To stick to the principles of responsible behavior and sustainable development, governments need reliable qualitative and quantitative data about the economic, social and environmental spheres.

At the macro level, reliable information about the global political, economic, social and environmental situation contributes to effective decision making. Environmental changes force governments to develop strategies on environmental protection. Information has a wide range of users, from one individual to the entire world.

Identification and analysis of information needs is a very topical issue today. To provide stakeholders with consistent and relevant information, such needs must be properly addressed and understood. For an economic entity, relevant information may produce strong economic and managerial benefits, while irrelevant information, on the other hand, may affect adversely the entity's market value and its development perspectives.

Key words: business, state, freight transportation, reliable information, stakeholders, information flows, environment, practice, enterprise, environmental changes, economic entities.

Introduction. Currently, given the increased awareness of the impact that the business may have on the economic, social and environmental spheres, business reputation and fundraising capacity largely depend on the information disclosed in the entity's statements and reports. Such reports should preferably outline both financial and non-financial aspects of the entity's activities. Reports containing both financial and non-financial information is the most convenient and widespread source of information for stakeholders. Such reports describe the development of an economic entity and its stability in the global context. This naturally raises the question of the appropriateness, composition, completeness, and reliability of the information disclosed. Fairly complete and reliable information is disclosed in sustainable development reports.

In the broad sense, the concept of sustainable development of economic entities is understood as ensuring long-term sustainable growth of the entity's environmental, social and economic performance indicators, both at the micro level, i.e. in the context of the entity itself, and at the macro level, i.e. in the context of the region, state, and the world. Filled with crisis events, instability of the global market, environmental changes, and a high level of competition, the current global environment affects economic entities to a varying degree.

Materials and Methods.

a. General.

The issues of information dependence and relevancy are extremely vital and topical for today's business community. Information is the driving force behind the growth of a specific business entity and

the world evolution in general. As wisely said by tycoon Nathan Rothschild in the 19th century, "He who owns information - he owns the world" [1].

b. Algorithm

Generally, scholars review information and related topics and concerns by applying a systemic approach and through connections with the economic, social and environmental issues. Thus, A.Yu. Markelov focuses on information economy [2] and E.Yu. Shurkina highlights the role of information resources in the economy [3].

The issues of sustainable development of economic entities are reviewed in the Decree of the Government of the Russian Federation of 5 May 2017 No. 876-p [4] and the works of N.E. Bibicheva [5], M.M. Basova [6], O.V. Efimova [6, 7], N.P. Lyubushin [5], E.V. Nikiforova [6,8,9], I.G. Ushanov [6], O.V. Shnaider [6,10,11] and others.

General issues of economic importance are investigated by M.A. Eskindarov and several other authors [12,13]. The issues of freight transportation are addressed in the works of I.I. Batishchev [14], and the aspects of the passenger and freight transportation business are reviewed by O.Yu. Matentseva and A.D. Khmelnitsky [15].

c. Flow Chart

There is no doubt that by applying sustainability accounting, economic entities can report their economic performance with due consideration of the growing environmental awareness and current social background.

Large companies are in the vanguard, but business communities around the world do understand that such trends will only intensify over the years. Interestingly, in Russia, the main economic entities that report their economic, social and environmental performance are those that may damage the nature and society significantly. We are speaking about the largest companies in the oil and gas industry, the energy sector, chemical, and iron and steel industries, and other major companies.

Results. Our research of information needs is based on the data disclosed by Federal Passenger Company, JSC (hereinafter – FPC), a publicly-traded company having a monopoly over railway transportation in Russia. Due to its huge social impact, the Company is under strict Government control in terms of both pricing and operations.

Since the interaction between an economic entity and its stakeholders is aimed at satisfying the latter's information needs, such stakeholders should be identified first. As sustainability reports cannot satisfy the information needs of all stakeholders, the priority and key indicators should also be defined.

The first group of stakeholders includes company managers and shareholders. They are more interested in such issues as labor productivity, compliance, customer loyalty, business reputation, all of which are linked to the social and environmental indicators.

The second group includes investors, suppliers, and lenders, who focus on solvency, liquidity, financial stability, business reputation, social and environmental risks in view of a particular investment decision.

The third group includes company employees, who, at the same time, represent the most valuable asset of most companies. The company spirit and employee loyalty play an important role in shaping the business reputation and labor productivity. These stakeholders pay attention to information about occupational health and safety, remuneration, rewards, and social programs.

The fourth group is the customers. These stakeholders need to know why they should choose a particular company over others, what are the company's competitive advantages, and how the quality of goods and services can be improved.

The fifth group consists of the Government and local communities. This group is interested in the company's compliance and contribution to regional development, i.e. through jobs, environmental protection, charity activities, taxes.

Sustainability reporting is an effective tool for managing an economic entity. Such reports are structured to satisfy the information needs of specific stakeholders about the entity's financial and economic activities and the associated risks.

As noted above, sustainability indicators are grouped into economic, social and environmental.

The economic performance of a company depends on its efficient use of various resources to ensure the sustainability of its business, financial stability, ability to fulfill obligations to contractors and the competitiveness of its products (services) while promoting its sustainable development.

Next, we will review each aspect of the concept of sustainable development in the context of the business activities of Federal Passenger Company, JSC. The economic aspect is the major concern for the

management, investors, suppliers and the shareholders (Russian Railways, PJSC and the Government of the Russian Federation as the ultimate beneficiary). The railway complex is of particular strategic importance to Russia. It is the connecting link to form a unified economy, ensure the stable operation of industrial enterprises, timely delivery of vital goods to the most distant corners of the country, and the most affordable transport for millions of citizens.

Considering the strategic role of FPC, it is obvious that it is not the financial result that concerns the stakeholders the most. In theory, the Government will always subsidize the Company and cover its losses, regardless of the possible decline of the industry and unstable financial position.

Following the review of the Company's IFRS financial statements, a conclusion can be drawn that as of December 31, 2018, the Company had a high equity to total assets ratio of 0.64 and equity plus long-term debt to total assets ratio of 0.85, despite a decrease by 7.6% and 0.25%, respectively, compared to the previous year figures.

In 2018, the cost of the Company's rolling stock increased by 23% or 33 million Russian Rubles, and the total of long-term borrowings grew by 84% or 18 million Russian Rubles. At the same time, in the total amount of long-term liabilities of 39 million Russian Rubles as of December 31, 2018, bonds account for 88% or 35 million Russian Rubles with the maturity date in 2027 or 2028. This is undoubtedly a positive factor due to minimizing the risks of covenant defaults resulting from the requirement to prematurely repay debts in case of a deterioration of the financial situation, which, in turn, can compromise the Company's ability to continue as a going concern.

Discussion. FPC has made the right decision to increase its rolling stock:

- firstly, the Company's main activity is railroad transportation, for which the rolling stock is required;

- secondly, with growing competition in the transportation sector, railroad transport is under increasing pressure from the air, truck and bus sectors.

In 2018, the rail share of the domestic long-distance passenger transport market was 39%, compared to 39.3% in 2017 and 42% in 2016. Thus, renewing the rolling stock would contribute to increasing the passenger traffic, which in 2018 amounted to 87.7 billion passenger-km, 6% higher as against the previous year. It should be noted that the rolling stock renewal strategy focuses on other things, beyond increasing the service life of cars. It can also be seen as an investment in customers because it results in improving the safety and quality of transportation and reducing the travel time, thus increasing the competitive advantages of rail transportation. In general, a conclusion can be drawn that the Company is financially stable and are no current indications of the Company's being unable to continue as a going concern.

It should be noted that the low yield on capital investments is affected by the fact that, having a monopoly over railway transportation, the Company must adhere to the detailed price lists approved by the Decree of the Federal Tariff Service of Russia of 27 July 2010 No. 156-т/1. In turn, the Company receives subsidies from the federal authorities to partially compensate for the effects of the tariff regulation in the field of passenger transportation. Accordingly, FPC receives less revenue than it could.

The downward dynamics of the Company's financial indicators explains the rather low return on sales of 0.06%, which decreased by 0.01 points as against the previous year. It is affected by the outstripping growth rate of the cost of sales due to the increased amount of maintenance (repair) of the rolling stock.

Based on the economic aspect review, the stakeholders can be sure that the Company will continue to be financially stable. They can also expect revenue growth from an increase in passenger turnover in the future periods as the Company focuses on updating its rolling stock and increasing the comfort and safety of the passengers. The safety of passenger trains is one of the Company's key priorities since it increases the attractiveness of rail transport to customers. However, strong competition in the industry, aggressive pricing policy, and rivalries in transportation distances of up to 1 thousand km remain the main threats to the Company's performance.

The social aspect of sustainable development is aimed at ensuring:

- industrial safety;

- regular payment of wages;

- medical and social insurance for employees;

- employee development (training seminars, advanced training), the implementation of social programs.

The social aspect is a matter of primary concern for the population, potential and current workers, the Government and the local communities.

FPC is a community-oriented company of great social importance. The Company also has a social program for its current and former employees and various community care beneficiaries.

As a socially responsible company, FPC also provides transportation services for people with disabilities: over 700 cars with special compartments for passengers with disabilities run in 150 directions. The Company offers various community care transportation services (see figure 1).

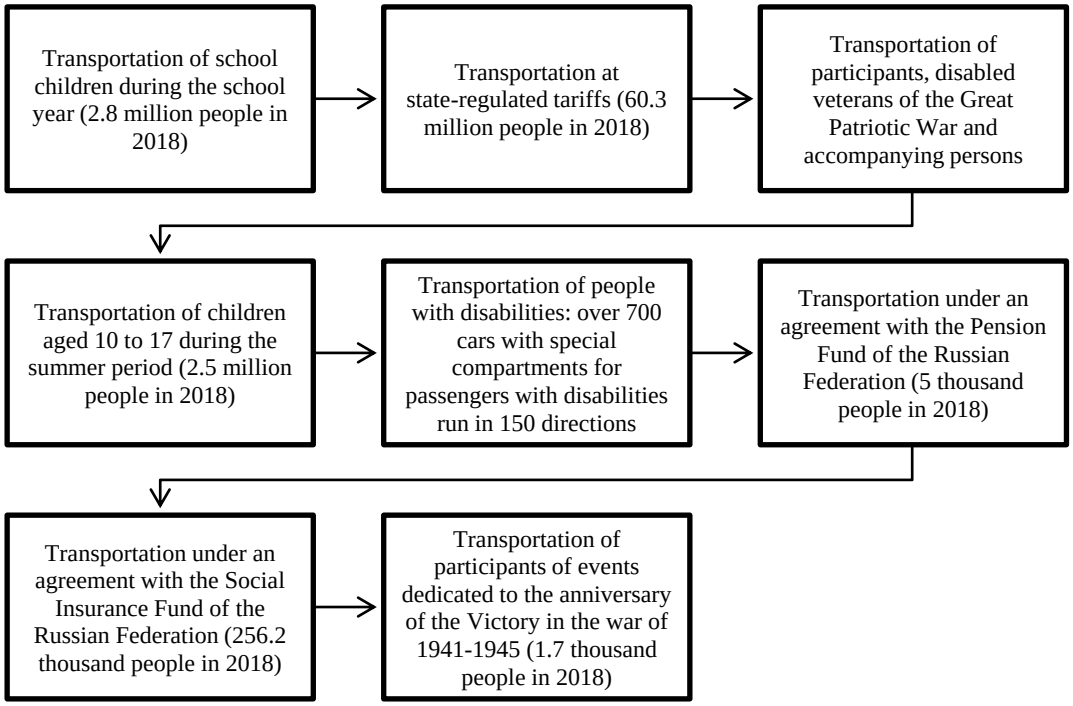

Figure 1 – Community care transportation services by FPC

The dynamics of the transportation load between the Russian Federation, the CIS countries and the Baltic States (%) is summarized in figure 2.

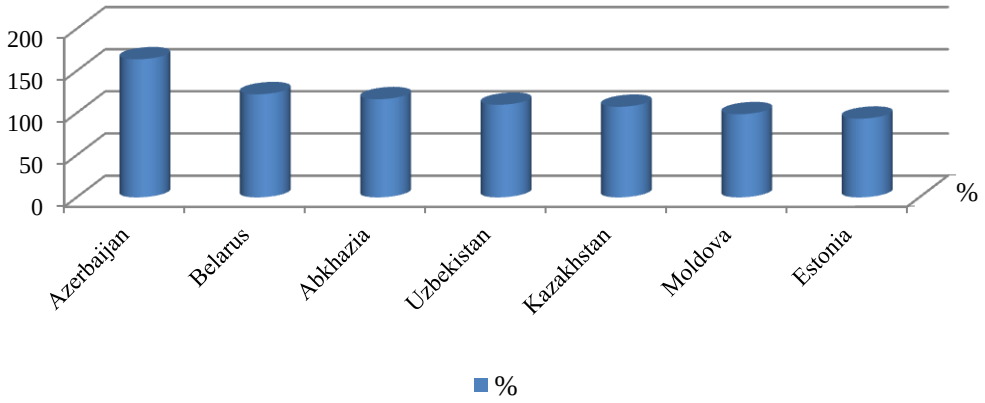

Figure 2 – Dynamics of the transportation load between the Russian Federation, the CIS countries and the Baltic States (%)

As of December 31, 2018, the Company's headcount totaled to 60,982 people, with 67% of all employees directly involved in passenger service.

FPC is fully aware of the importance of its staff and understands the benefits of investing in employee development and training. Remarkably, 22% of the staff are aged 50 and above. This is a rather high percentage that proves the Company stability and provides confidence about the future both for the

current and potential employees. The Company's age policy is on-trend considering the recent increase in the pension age in Russia.

According to the information disclosed in the financial statements, FPC implements training and advanced training programs for its employees. In 2018, 31% of all staff took training courses on the topics related to the specifics of the Company's activities in the technical and administrative fields, as well as in such areas as management and accounting.

The Company also implements the Corporate Housing Program to provide mortgage subsidies to its employees. In 2018, the total expenditure under the housing program totaled to 79 million Russian Rubles.

The bargaining agreement provides for an individual social security package totaling to 53.4 thousand Russian Rubles per employee in 2018.

The Corporate Health Improvement Program provides health resort treatment and rest opportunities for the current and former employees of FPC. In 2018, a total of 2,839 subsidized sanatoria and holiday-homes vouchers were used by the Company employees and pensioners. Also, 2,231 summer and health camp vouchers were purchased for the employees' children.

The social focus of the Company's activities is reported in detail in its non-financial disclosures, including contributions to the wellbeing of the Company employees and charity projects.

Next, attention should be paid to another important aspect of the concept of sustainable development - environmentalization. The environmental aspect of sustainable development manifests itself in activities aimed at protecting and restoring the environment, the Company's impact on resource consumption, emissions, and conservation of ecosystems.

FPC carries out environment-related activities under the environmental laws and regulations of the Russian Federation, the Environmental Program of Russian Railways, JSC, internal standard 1.16.001–2016 Environmental Management System.

In accordance with the above documents, FPC carries out many environment-related activities as summarized in figure 3.

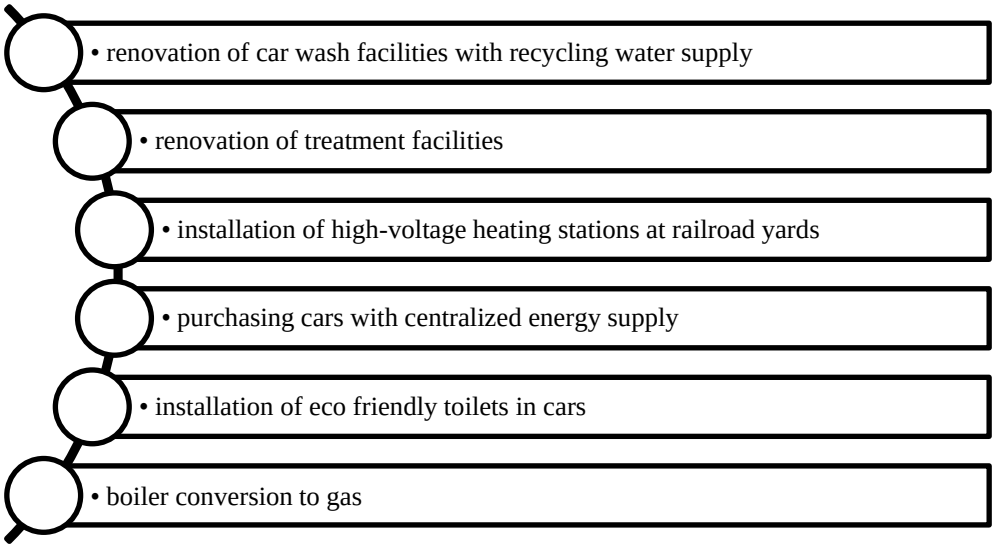

Figure 3 – Environment-related activities of FPC

The general sustainable development indicators of FPC are summarized in table 1.

Table 1 – Sustainable development indicators

Indicator	2016	2017	2018
Waste generation, thousand tonnes	103.9	103	102
Wastewater discharge to the environment, thousand m^3	71.3	71.4	70.8
Water use, million m^3	7.7	7.5	6.7
Air emissions, thousand tonnes	6.1	5.6	5.2

According to table 1, as a result of the reported measures, in 2018, waste generation decreased by 3.8%, wastewater discharge to the environment - by 11.3%, and water use - by 30.9, as compared to the figures of 2011.

The Company has established target figures to be achieved by 2021 (see table 2).

Table 2 – Target figures

Indicator	2018	2019	2020 target	2021 target
Amount of investment, net of VAT, billion RUB	43.9	42.1	45.3	47.9
Revenue (income), billion RUB	226.1	231.7	243.0	256.2
EBITDA incl. subsidies, billion RUB	26.8	27.7	33.8	38.7
Federal subsidies, billion RUB	8.6	7.7	8.5	8.6
Traffic safety, events per million train-kilometers	0.0049	0.0064	0.0063	0.0062
Labor productivity growth rate, %	108.5	103.5	101.2	105.0
Passenger turnover, billion passenger-km	92	92	93	98
Net profit, billion RUB	6.1	5.0	8.3	11.0

In its statements and reports, the Company discloses a commitment to a conscientious attitude towards the environment and the ongoing measures to reduce emissions and excessive consumption of resources, with positive dynamics.

Following a review of the economic aspect, it is established that in 2018 the Company is financially stable, and the increase in its long-term debt is part of the strategy for updating and renewing the rolling stock. These measures are aimed at increasing the service life of cars, expanding the rolling stock, improving the business competitiveness and promoting customer satisfaction.

The social and environmental aspects disclosed by the Company in the corporate reports fully unfold the Company's social focus, its contribution to employee development and retention, as well as the implementation of measures aimed at environmental protection.

The practice-oriented analysis of the current information needs of passenger and freight transportation enterprises draws attention to the fact that financial and non-financial indicators help to obtain expanded information about the business environment in which the Company operates, "deeply assess the investment risks (including non-financial), quality of corporate governance, opportunities and limitations associated with various social and environmental aspects of activities" [16,17,18]. By disclosing reliable and complete information, FPC ensures transparency of its financial and non-financial reporting for the stakeholders and enjoys the trust of various users, potential investors, consumers and the public in general.

Conclusion. Information disclosed by FPC demonstrates transparency and focus on priority stakeholders and their requirements for sustainable development. The effect in each of the areas of sustainable development is achieved through balanced corporate governance, without affecting other areas. Each economic entity has a circle of key stakeholders interested in corporate information. Depending on the importance of the company, a specific demand for information is also shaped.

Currently, people become increasingly aware of the climate changes, scarcity of natural resources, and the importance of qualified, loyal personnel. Therefore, large and influential companies are expected to take decisive measures to develop and implement programs aimed at solving the current and future problems. According to the 2030 Development Strategy, FPC aims to become the leader in the passenger transportation market of the Russian Federation, continue to be financially stable and focus on the customer needs to increase the Company value, while promoting passenger and freight mobility in all segments and regions of the Russian Federation.

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РЕСЕЙДЕГІ ЖОЛАУШЫЛАР ЖӘНЕ ЖҮК ТАСЫМАЛЫМЕН АЙНАЛЫСАТЫН ҚАЗІРГІ ЗАМАНҒЫ КӘСІПОРЫНДАРДЫҢ АҚПАРАТТЫҚ ҚАЖЕТТІЛІГІ

Аннотация. Қазіргі заманғы бизнес-шарттар ақпараттық ағынсыз жүргізілмейді, өйткені ақпарат олардың қызмет саласына қарамастан экономикалық субъектілердің барлық құрылымдық үдерістеріне енеді. Ақпараттық тәуелділік тек экономикалық субъект, мүдделі тарап, мемлекет тарапынан ғана емес, сонымен бірге бүкіл әлемде байқалады. Сенімді және уақытылы ақпаратқа деген қажеттілік айқын.

Ақпарат XXI ғасырдың ең құнды ресурсы болып саналатынына күмән жоқ. Ақпарат өңделеді, сандық немесе сапалық мазмұндағы мәліметтер жүйеленеді. Әлемдік экономикалық оқиғалар, экологиялық апаттар, әлеуметтік толқу туралы ақпарат әлемдік кеңістікке кіретін түрлі мемлекеттердің де, белгілі бір мемлекеттің аумақтық құрамына кіретін шаруашылық жүргізуші субъектілердің де жоспарына түзету енгізеді. Қазіргі уақытта жауапкершілік пен тұрақты даму қағидаттарына негізделген мемлекеттік тәжірибе барлық әлем мемлекеттері үшін қажеттілік болып саналады, бұл экономикалық, әлеуметтік және экологиялық маңызды мәліметтермен толтырылған сенімді сапалы және сандық ақпарат алуға байланысты.

Макро деңгейде әлемдік саяси, экономикалық, әлеуметтік және экологиялық өзгерістер туралы ақпарат тиімді іскери шешім қабылдау үшін алаң қалыптастырады. Табиғи өзгерістер мемлекетті қоршаған ортаны сақтауға бағытталған даму жолдарын қалыптастыруға мәжбүр етеді. Әртүрлі сипаттағы ақпаратқа қызығушылық танытатын пайдаланушылар шегі едәуір кең және жеке адамнан әлемдік қауымдастыққа дейін анықталған.

Мүдделі тараптардың ақпараттық қажеттіліктерін анықтау және талдау қазіргі уақыттың өзекті мәселесі болып саналады. Бұл мәселенің талғампаздығы мен түсінігі мүдделі тараптарға берілетін ақпаратқа тікелей әсер етеді. Егер экономикалық субъектінің қызметіне ақпараттық әсер етуді қарастыратын болсақ, онда ақпарат тиісті экономикалық және басқарушылық тұрғыда әсер етуі мүмкін, ал маңызды емес ақпарат белгілі бір шаруашылық жүргізуші субъектінің нарықтық құнына, сондай-ақ оның одан әрі даму перспективасына теріс әсер етуі ықтимал.

Түйін сөздер: бизнес, мемлекет, жүк тасымалы, сенімді ақпарат, мүдделі пайдаланушылар, ақпарат ағыны, қоршаған орта, тәжірибе, кәсіпорын, экологиялық өзгерістер, шаруашылық субъектілері.

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ИНФОРМАЦИОННЫЕ ПОТРЕБНОСТИ СОВРЕМЕННЫХ ПРЕДПРИЯТИЙ, ОСУЩЕСТВЛЯЮЩИХ ПАССАЖИРСКИЕ И ГРУЗОВЫЕ ПЕРЕВОЗКИ В РОССИИ

Аннотация. Современные условия ведения бизнеса не обходятся без информационных потоков, так как информация проникает во все структурные процессы экономических субъектов независимо от их сферы деятельности. Информационная зависимость наблюдается не только со стороны экономических субъектов, стейкхолдеров, государства, но и мирового пространства в целом. Потребность в достоверной и своевременной информации очевидна.

Бесспорно, что наиболее ценным ресурсом двадцать первого века считается информация. Информация представляет собой обработанные, систематизированные данные количественного или качественного содержания. Информация о мировых экономических событиях, экологических катастрофах, социальных волнениях вносит корректировки в определенные планы, как различных государств, входящих в мировое пространство, так и экономических субъектов, территориально принадлежащих тому или иному государству. В настоящее время государственная практика, построенная на принципах ответственности и устойчивом развитии является необходимостью для всех мировых государств, это обусловлено получением достоверной качественной и количественной информации наполненной данными экономического, социального и экологического значения.

На макроуровне информация о мировых политических, экономических, социальных и экологических изменениях формирует поле для принятия эффективных бизнес решений. Изменения природного характера заставляют государство формировать пути развития направленные на сохранение окружающей среды. Границы заинтересованных пользователей информации различного характера достаточно широки и определяются от одного индивида до мирового сообщества в целом.

Выявление и анализ информационных потребностей заинтересованных лиц – это весьма актуальный вопрос нашей современности. Проработанность и понимание данного вопроса оказывает непосредственное влияние на предоставляемую заинтересованным лицам информацию. Если рассматривать информационное влияние на функционирование экономического субъекта следует отметить, что релевантная информация способна оказать должный экономический и управленческий эффект, а нерелевантная информация способна негативно повлиять на рыночную стоимость данного субъекта хозяйствования, а также его дальнейшую перспективу развития.

Ключевые слова: бизнес, государство, грузоперевозки, достоверная информация, заинтересованные пользователи, информационные потоки, окружающая среда, практика, предприятие, экологические изменения, экономические субъекты.

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МАЗМҰНЫ

Ғылыми мақалалар

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Уважаемые авторы научных журналов НАН РК!

Президиумом НАН РК принято решение, в целях повышения международного рейтинга академических изданий, объединить следующие 3 журнала, начиная с № 5 (сентябрь-октябрь), 2020 г., с высокорейтинговыми журналами НАН РК, входящими в международные базы Scopus, WoS и др.:

1. **«Известия НАН РК. Серия биологических и медицинских наук»** объединить с журналом «Доклады НАН РК»;

2. **«Известия НАН РК. Серия аграрных наук»** – «Доклады НАН РК»;

3. **«Известия НАН РК. Серия общественных и гуманитарных наук»** – с журналом «Вестник НАН РК».

Статьи, которые публиковались в журналах «Известия НАН РК. Серия биологических и медицинских наук» и «Известия НАН РК. Серия аграрных наук», впредь будут публиковаться в журнале **«Доклады НАН РК»**, а статьи, публикуемые в журнале «Известия НАН РК. Серия общественных и гуманитарных наук», – в журнале **«Вестник НАН РК».**

При подаче статей просим указывать название журнала и отрасль науки, согласно представленного перечня (см. ниже) в данном журнале:

I. Научный журнал **«Вестник НАН РК»** посвящен исследованиям фундаментальной науки (гуманитарные и естественные):

Редакционная коллегия принимает статьи по следующим отраслям науки:

1. Гуманитарные (экономика, юриспруденция, история и археология, политология и социология, философия, филология, педагогика и психология, литературоведение, искусствоведение)
2. Естественные (астрономия, физика, химия, биология, география и технические науки). Примеры технических наук: космонавтика, кораблестроение, машиностроение, системотехника, электротехника, электросвязь, радиоэлектроника, ядерная энергетика и т.д.

Адрес сайта «**Вестник НАН РК**» – http://www.bulletin-science.kz/index.php/en/arhive

II. Научный журнал **«Доклады НАН РК»** посвящен исследованиям в области получения наноматериалов, биотехнологии и экологии.

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1. Получение наноматериалов в области естественных наук, медицины и сельского хозяйства.
2. Биотехнология в земледелии, растениеводстве и зоотехнике.
3. Общая биология и биотехнология в медицине.
4. Экология.

Адрес сайта «**Доклады НАН РК**» – http://reports-science.kz/index.php/en/archive

Кроме того, в журналах «Известия НАН РК. Серия физико-математическая», «Известия НАН РК. Серия химии и технологий» и «Известия НАН РК. Серия геологии и технических наук» также указаны отрасли науки, по которым будут приниматься научные статьи для экспертизы и дальнейшего опубликования:

III. Научный журнал **«Известия НАН РК. Серия физико-математическая»** посвящен исследованиям в области математики, физики и информационной технологии.

Редакционная коллегия принимает статьи по следующим отраслям науки:

1. Математика.
2. Информатика.
3. Интеллектуальный анализ данных и распознавание образов.
4. Математическое моделирование социальных и экономических процессов.
5. Механика.
6. Механика машин и роботов.
7. Теория управления и космические исследования.
8. Физика.
9. Ядерная физика.
10. Теоретическая физика.
11. Астрономия.
12. Ионосфера.

Адрес сайта «**Известия НАН РК. Серия физико-математическая**» –
http://physics-mathematics.kz/index.php/en/archive

IV. Научный журнал **«Известия НАН РК. Серия химии и технологий»** посвящен исследованиям в области химии и технологий новых материалов.

Редакционная коллегия принимает статьи по следующим отраслям науки:

1. Органическая химия.
2. Неорганическая химия.
3. Высокомолекулярные соединения.
4. Физическая химия (катализ, электрохимия).
5. Технология новых материалов.
6. Технология органических веществ.
7. Технология неорганических веществ.
8. Технология химических удобрений.
9. Технология полимерных и строительных материалов и силикаты.
10. Технология пищевых продуктов.
11. Фармацевтическая химия.

Адрес сайта **«Известия НАН РК. Серия химии и технологии»** –
http://chemistry-technology.kz/index.php/en/arhiv

V. Научный журнал **«Известия НАН РК. Серия геологии и технических наук»** посвящен исследованиям в области геологии и технических наук:

Редакционная коллегия принимает статьи по следующим отраслям науки:

1. Геология.
2. Региональная геология.
3. Петрология.
4. Геология нефти и газа.
5. Геология и генезис рудных месторождений.
6. Гидрогеология.
7. Горное дело и геомеханика.
8. Фундаментальные проблемы обогащения минерального сырья.
9. Инженерная геология.
10. Геофизика и сейсмология.
11. География.

Адрес сайта **«Известия НАН РК. Серия геологии и технических наук»** –
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