Of the development of labour potential of the AIC of Kazakhstan: econometric analysis

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Of the development of labour potential of the AIC of Kazakhstan: econometric analysis

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Annotation. *Purpose* - to conduct study of current state of labor potential of rural areas, prospects for the development of social and economic aspects of rural areas in successful modernization. Consider theoretical foundations of economic and mathematical modeling of the dynamics of labor potential development. *Methods* - it is proposed to use methodology of carrying out forecast calculations based on econometric model in the form of a system of joint equations that traces the connection between labor potential and changes in demographic structure of the country's rural population. In the study the statistical data series provided by the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan is used. The measures of state support aimed at the development of labour resources of rural areas have been analysed and summarised. In order to determine the value of the main statistical indicators characterising the dynamics of the development of labour resources of rural areas in the Republic of Kazakhstan for the coming period of time, calculated forecast models were used. *Results* - represent the analysis of current challenges and opportunities that labor potential of rural areas faces in the context of modernization of the AIC of Kazakhstan. *Conclusions* - on the basis of forecast calculations of indicators reflecting the trends in the development of labour potential of the agro-industrial sector the possibilities of increasing the GDP of products and (services) of agriculture, forestry and fisheries have been identified. Additional ways of development of labor potential of rural areas of Kazakhstan in the context of modernization of agro-industrial complex, aimed at improving the state of agricultural science, creating conditions for the growth of labor productivity in agriculture are proposed.

Keywords: modernization, labor potential, rural areas, modeling, economics, government support, factor indicators, model equation, labor resource, agro-industrial complex, resource potential, employment

Развитие трудового потенциала АПК Казахстана: эконометрический анализ

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Аннотация. *Цель* - провести исследование текущего состояния трудового потенциала агропромышленного комплекса сельских территорий, перспектив развития социальных и экономических аспектов сельских территорий при успешной модернизации. Рассмотреть теоретические основы проведения экономико-математического моделирования динамики развития трудового потенциала агропромышленного комплекса (АПК) Казахстана. *Методы* - предложено применение методики проведения прогнозных расчетов на базе эконометрической модели в форме системы совместных уравнений, прослеживающей связь трудового потенциала с изменениями в демографической структуре сельского населения страны. Для исследования использованы статистические ряды данных, предоставленные Бюро национальной статистики Агентства по стратегическому планированию и реформам Республики Казахстан. Проведен обзор мер государственной поддержки, направленных на развитие трудового потенциала сельских территорий. В результате проведенного научного исследования получены расчетные прогнозные модели, по которым определены значения основных показателей статистики, характеризующих динамику развития трудового потенциала сельских территорий в Республике Казахстан на перспективный период. *Результаты* представляют собой анализ текущих вызовов и возможностей, стоящих перед трудовым потенциалом сельских территорий в контексте модернизации агропромышленного комплекса Казахстана. *Выводы* - на основании прогнозных расчетов показателей, отражающих тенденции развития трудового потенциала агропромышленного сектора выявлены возможности увеличения ВВП продукции и (услуг) сельского, лесного и рыбного хозяйства. Предложены дополнительные пути развития трудового потенциала сельских территорий Казахстана в контексте модернизации агропромышленного комплекса, направленных на улучшение состояния сельскохозяйственной науки, создание условий для роста производительности труда в сельском хозяйстве.

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Ключевые слова: модернизация, трудовой потенциал, сельские территории, моделирование, экономика, государственная поддержка, факторные показатели, уравнение модели, трудовой ресурс, агропромышленный комплекс, ресурсный потенциал, занятость населения.

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Introduction

High-quality strategic development of rural areas is becoming a key element for the state, since it has significant impact on ensuring food security. To achieve this important task, it is necessary to identify strategic priorities aimed at supporting the development of rural areas in Kazakhstan.

The study of rural areas remains a priority topic for many scientists around the world, including researchers from Kazakhstan. The concept of "rural development is not only subject to different interpretations, but has also actively evolved in recent decades as a concept, reflecting different points of view.

The connection between labor potential and rural progress is a complex and significant interaction that has a significant impact on socio-economic situation of rural population and development of agricultural sector.

Labour migration is not insignificant in helping to develop rural areas. Thus, labour migration contributes to the abandonment of agricultural land by rural households, which has a negative impact on the development of rural areas (Dingde Xu, Xin Deng, Shili Guo et al.) [1].

In addition, labour force is the main part of agro-industrial complex because, rural labour force affects the willingness of farmers in different regions to influence the scale of exploitation of cultivated land and the adoption of agricultural machinery technology. At the same time, in the process of farming, the demonstration of income effect, extension effect, the distribution of farmers' resources in the form of local labour, chemical fertilizers, pesticides, agricultural machinery, land and other factors affect the distribution of resource factors among farmers in other regions (Zhang Weikun, Liang Hanyuan, Chen Zhe et al.) [2].

The purpose of this study is to research the relationship between labour potential and rural development. This issue represents a complex balance between various economic, social and demographic factors, which requires careful and comprehensive analysis to ensure the sustainability and well-being of rural areas (Akimbekova Ch.U.) [3].

The government's employment policy has acquired an important social status in ensuring stability in the labour market. As part of the Kazakhstan-2050 strategy, the Employment Roadmap programme was an important step towards achieving the goals. It has created new jobs and increased incomes. It has also contributed to the creation of sustainable and productive employment for unemployed citizens, as well as for those who cannot find a job due to lack of means.

Literature Review

In general, significant attention has been paid to the development of agro-industrial complex in a number of studies. Some of the works focus on studying institutional changes in agricultural and industrial sectors.

The significance of labor potential and its role in public administration and regulation of the agro-industrial complex is the primary focus of scientific research.

These scientific studies were carried out in various periods by such scientists as (Lovchikova E.I., Zvereva G.P., Volchkova A.S.; Proka N.I; Cherdancev V.P.) [4-6]. The studies by Lovchikova E.I., Zvereva G.P., Volchkova A.S. [4], who pay much attention to the study of staffing of agricultural organizations, the peculiarities of motivation and stimulation of labour activity of personnel in agriculture, the study of the main trends in the development of personnel of agricultural organizations, who also formulated the main directions for improving the staffing of agriculture, are of no small importance

The significance of the problem of personnel potential development, its modern role in ensuring the competitiveness of the economy, aggravated by structural changes in the country's personnel potential, especially in agriculture is revealed in his works by (Proka N.I.) [5]

Cherdantsev's V.P. [6] studies are related to the problems of the quality of human resources and human resources potential of agro-industrial and fishery complexes

Kaliev G.A.; Moldashev A.B., Akimbekova Ch.U, Zhumasheva S.T. at al.; Belgibayeva A.S., Musina A.J., Volokhova M.A. [7-9] take active part in Kazakhstani research on the AIC and issues of labor potential and food security. Kerimova U.K., Kasenbaev G.S.; Nurzhanova G.I., Saparova G.K., Saginova S.A. [10, 11] are involved in study of the issues of agricultural development, including issues of ensuring its sustainability.

Numerous scientific studies are devoted to the issues of development and modernization of AIC. A number of works highlight issues of institutional changes in agricultural sector.

The article also considers and studies the work of Putsenteilo P., Klapkiv Y., Karpenko V. at al. [12] which is based on the study of the possibilities of institutional system reform of the agrarian sector, where the researchers studied the formation and development of agrarian institutionalism, which fulfils a key role in the agrarian economy of the region. According to researchers, it was these institutional changes, which arose as a side effect of industry modernization, that contributed to the evolution of the entire agro-industrial complex.

Research indicates that such changes are driven by fluctuations in relative input prices, as well as evolution of organizational structures and institutions between enterprises and agro-industrial production sectors.

Materials and methods

The modern process of modernization of agriculture is the result of the interaction of many factors, covering not only the introduction of innovations, but also physical, economic, organizational, cultural and motivational aspects. Despite the diversity and varying the importance of these factors, and the impossibility of achieving high level for all of them at the same time, it is possible for them to gradually accumulate and improve over a long period of time.

Specifics of agricultural modernization are associated with a high level of risks. Agricultural producers are limited in their ability to quickly adapt to changes in market conditions. In addition, agriculture is characterized by dynamic properties inherent in certain types of fixed assets, such as machines and tractors

and vehicles. These elements change their spatial location and nature of work over time, which determines the high controllability of this part of fixed assets in agriculture.

At the end of 2022, the rate of depreciation of fixed assets in agricultural sector was 36.4%, while the rate of renewal of fixed assets was only 15.2%. Our estimates indicate that these figures are significantly underestimated, taking into account that the wear and tear of fixed assets in agriculture is one of the important problems of this industry (Bureau of National Statistics of the Agency…) [13].

In accordance with the existing Concept of the AIC, it's noted that the level of wear and tear of the machines and tractors in agricultural sector is on average 76% (80% for tractors and 72% for combines). The material and technical base of hydrogeological and reclamation services has remained without updates for more than 10 years, while almost all fixed assets in this area have almost 100% wear and tear - buildings and structures, vehicles are in poor conditions or unusable technical condition. Due to limited resources, many peasant and private farms cannot afford to update their machines and tractors and other fixed assets and key assets.

In our opinion, one of reasons for high level of wear and tear in agriculture is underdevelopment of investment lending and leasing market. As mentioned earlier, instead of solving problems in agricultural lending market, the state continues to provide preferential loans at low interest rates through development institutions. Since the volumes of preferential lending are limited, large agricultural enterprises are usually the main recipients of such loans.

Moreover, the lack of private ownership of agricultural land sharply reduces the availability of lending due to limited opportunities for providing land as collateral. In addition to this, it is worth noting general underdevelopment of the service system, including the limited efficiency of processes for restoring parts of agricultural machinery.

However, studies of the state, trends and prospects for development of agricultural production factors in conditions of active modernization of agricultural industry are not given due attention. The study of interaction of agricultural production factors is insufficiently studied area.

In addition, the shortage of agricultural workers limits access to quality agricultural products, which can be significantly exacerbated if there is an imbalance in the distribution of labour resources and affect the food security of the country (Rahmatullina L.I.) [14].

Practice requires clarification of the models proposed in scientific researches for forecasting the prospects for the development and modernization of the AIC in order to obtain results that are more adequate to current circumstances in the interests of solving the problems of preparation and development of the AIC, capable of making the transition to innovative model of agricultural production.

Result

In applied economic and mathematical analysis and forecasting, modelling of multidimensional time series is particularly emphasized with the use of regression and correlation analysis. The models developed in this area make it possible to represent with a sufficient degree of accuracy the relationships between the

indicators under study, and also make it possible to assess the degree of influence exerted on the results.

We will use a multifactor data analysis to identify patterns in the change of the process being studied, with an example of this using forecasting of the indicators. Time series data of the factors studied for the period 2017-2022 is utilized in the following calculations (table 1).

Table 1 – Factors that affect labour potential development in rural areas during the period of 2017 to 2022

	2017	2018	2019	2020	2021	2022
Gross output of products (services) of agriculture, forestry and fisheries, million tenge	3 817 237,1	4 497 585,4	5 177 893,7	6 363 976,1	7 549 827,9	9 521 002,3
Rural housing stock, total area of housing, at the end of the year, million sq. m.	127 332	130 297	132 877	134 494	137 481	141 237
Fixed assets in kind:						
Production of tractors for agriculture and forestry, pieces	292	350	1047	2 398	5 160	5 384
Production of seeders, planters and transplanters, pieces	185	236	223	197	238	235
Mower production, including tractor-mounted mowers, not included into other groups, pieces	69	155	238	383	491	588
Average monthly nominal wage per employee by economic sector Agriculture, forestry and fisheries), tenge	70 959	97 929	115 371	130 178	150 705	190 086
Rural population, thousand people	3 840,1	3 861,4	3 830,7	3 768,6	3765,0	3 646,5
Rural population by level of education, higher, thousand people	835	906,5	886,6	1 054,5	959,6	1 121,1
Rural population by level of education, secondary specialized, thousand people	1 353,8	1 434,4	1 521,1	1 346,6	1540,6	1 673,8
Rural population by level of education, general secondary, thousand people.	917,4	898,9	869,6	853,5	505,1	429,5
Note: the table is compiled according to the source data from (Bureau of National Statistics of the Agency…) [13]						

Let's introduce symbols for constructing a system of equations for econometric multifactor model (table 2).

Table 2 – Symbols of main statistical indicators characterizing the dynamics of development of labor potential of rural areas in the Republic of Kazakhstan

Factor Designation	Name of factor	Unit of measurement
Y	Gross output of products (services) of agriculture, forestry and fisheries	mln tenge
X_1	Rural population	thous.people

X_2	Rural housing stock, total area of dwellings, at the end of the year	mln sq.m
X_3	Average monthly nominal wage per employee by economic sector (Agriculture, forestry and fisheries)	tenge
X_4	Rural population by level of education, higher	thous.people
X_5	Rural population by level of education, secondary specialized	thous.people
X_6	Rural population by level of education, secondary general	thous.people
X_7	Production of tractors for agriculture and forestry	pieces
Note: table compiled by the authors		

In our opinion, the presented factor characteristics cover the main components characterizing the dynamics of development of labor potential of rural areas, and by introducing the appropriate degree of detail into the selected numerical indicators of statistical data, the opportunity is provided for modeling and analyzing their development in the process of dynamics (1).

$$\begin{cases} Y = a_0 + a_1 \cdot X_1 + a_2 \cdot X_3 + a_2 \cdot X_7 \\ X_1 = a_0 + a_1 \cdot X_2 \\ X_3 = a_0 + a_1 \cdot X_4 + a_2 \cdot X_5 + a_2 \cdot X_6 \end{cases} \quad (1)$$

Based on the findings of several authors' research, the model built upon dynamics of economic processes provides quite satisfactory results for forecast values. It is appropriate to apply the methodology used in this study to construct a dynamic model of multifactor forecasting (Zamkov O.O., Tolstopyatenko A.V., Cheremnyh Yu.N.) [15].

On the example of the first equation of the multifactor model we will carry out a quantitative analysis and forecast of the selected factor indicators.

In each specific year, a multifactor model is created for each time period L under study, which should take into account the lack of dependence between the explanatory variables of the regression model and the rationale for the analytical type of the model. Estimates of the main factor should be not only comparable, but also efficient as well as wealthy in the time period under study (Garmash A.N., Orlova I.V., Fedoseev V.V.) [16] (2):

$\hat{Y}_l = a_0 x_0 + a_1 x_1 + a_2 x_2 + ... + a_m x_m$ (2)

where Y_l is modeled indicator of the l year;

x_i – factors influencing on this indicator, $i = \overline{0, m}$;

a_i – coefficients of model equation, $i = \overline{0, m}$;

m – number of factor characteristics.

The resulting regression equation has the following form (3):

$Y = 8645748{,}16 + 225{,}05 \cdot X_1 - 8724{,}57 \cdot X_3 + 159{,}17 \cdot X_7$ (3)

Try to perform statistical analysis of the obtained regression equation, i.e. check the significance and value of the equation, its coefficients and identify absolute and relative errors of approximation.

To estimate the unbiased variance, we need to perform the following calculations:

Unbiased error ε = Y - Y(x) = Y - X*s (absolute approximation error) ULT (**table 3**).

Table 3 – Calculated parameters of regression equation

Y	Y(x)	ε = Y - Y(x)	ε^2	$(Y-Ycp)^2$	$\|ε : Y\|$
3817237,1	3845471,91	-28234,81	797204121,93	5463204944588,3	0,0074
4497585,4	4336152,93	161432,46	26060440656,46	2745654578569,5	0,0359
5177893,7	5295575,97	-117682,27	13849117131,42	953929965047,1	0,0227
6363976,1	6416321,76	-52345,65	2740067922,35	43843760300,6	0,00823
7549827,9	7559592,45	-9764,55	95346467,78	1946696936492,7	0,00129
9521002,3	9474407,48	46594,82	2171077292,92	11332751411005	0,00489
			45713253592,86	22486081596003	0,0804
Note: calculated by the authors					

Calculated unbiased variance estimate (4):

$$s^2 = \frac{1}{n-m-1} \cdot s_e^2 = \frac{1}{6-3-1} \cdot 45713253592{,}8 = 22486081596003 \text{ (4)}$$

Next, the value of standard deviation (5) is assessed:

$$S = \sqrt{S^2} = \sqrt{22486081596003} = 151184{,}082 \text{ (5)}$$

The next step is to calculate standardized regression coefficients - β-coefficients (β_i). These coefficients show by what part of standard deviation of the variable Y will change when the factor X_i changes by one standard deviation (S_{xj}), provided that the remaining factors remain unchanged in the model.

Based on the β_i maximum value, it is possible to estimate which factor has a more significant impact on the Y variable.

Based on elasticity coefficients and β-coefficients, opposite conclusions can be drawn. This may be due to:

a) large variation in one of the factors;

b) various directions of influence of factors on the result.

The coefficient β_i can also be interpreted as a measure of the direct impact of the j- factor (xj) on the dependent variable (y). In multiple regression, the j- factor has not only a direct, but also indirect effect on the result (that is, through other factors in the model).

The indirect impact is assessed through the value: $\sum \beta_i r_{xj,xi}$, where m - factors in the model. The total influence of the j- factor on the result appears, which is equal to the sum of the direct and indirect impacts, and evaluates the linear pair correlation coefficient of this factor and the result - $r_{xj,xi}$.

In the ongoing analysis, it is important to note that the direct impact of the factor (X1) on the resulting sign (Y) in the regression equation is characterised by the value of the coefficient βj, which according to these calculations is 0.529 .

The next most important step in analysing the equation of a multifactor model is the calculation of the multiple correlation coefficient, which provides information about the degree of interrelation between the considered factor variables.

The calculated multiple correlation coefficient (R) (6) provides an estimate of the extent to which the factors involved in the model equation jointly influence the outcome:

$$R = \sqrt{1 - \frac{S_{\hat{e}}^2}{\sum(y_i - \bar{y})^2}} = \sqrt{1 - \frac{45713253592,861}{22486081596003}} = 0,997 \qquad (6)$$

Next, the hypotheses regarding the coefficients of the regression equation are tested to determine the statistical significance of the parameters of the multiple regression equation.

The result of the t-criterion obtained from the observations is compared with the tabulated value of the t-criterion, which is determined on the basis of Student's distribution tables. Such tables are usually found at the end of textbooks and workshops in statistics or econometrics. The tabulated value depends on the chosen significance level (*a*) and the number of degrees of freedom, which for linear paired regression is (*n-2*), where n is the number of observations.

If the observed value of the t-criterion exceeds the tabulated value (modulo), the main hypothesis is rejected. This means that with probability (*1-a*) the parameter or statistical characteristic in the general population has a significant difference from zero.

If the observed value of the t-criterion is less than the tabulated value (modulo), then there is no sufficient reason to reject the main hypothesis. That is, the parameter or statistical characteristic in the general population has no significant difference from zero at a given significance level *a*.

For our ongoing study, the results of calculations of statistical significance of estimates of regression coefficients b0 , b1 , b2 , b3 do not fully correspond to the calculated values.

Next, we will make calculations to determine the confidence intervals of regression equation coefficients.

Let's define confidence intervals for regression coefficients with confidence level of 95%:

$(b_i - t_{\text{табл}} \times S_{bi}; b_i + t_{\text{табл}} \times S_{bi})$

b_0: (8645748,16 – 6,205×12350181,34; 8645748,16 + 6,205×12350181,34) =
= (-67987127,07; 85278623,39)

Since calculated interval includes 0, the coefficient b_0 is not significant.

b_1: (225,053 – 6,205×46,151 ; 225,053 + 6,205×46,151) = (-61,312; 511,42)

Since calculated interval includes 0, coefficient b_1 is not significant.

b_2: (-8724,569 – 6,205×2120,525 ; -8724,569 + 6,205×2120,525) =
= (-21882,424; 4433,287)

Since calculated interval includes 0, the coefficient b_2 is not significant.

b_3: (159,17 – 6,205×86,244 ; 159,17 + 6,205×86,244) = (-375,971; 694,312)

Since the calculated interval includes 0, coefficient b_3 is not significant.

Therefore, the determination index will be calculated as follows (7):

$$R^2 = 1 - \frac{s_e^2}{\sum(y_i - \bar{y})^2} = 1 - \frac{45713253592{,}861}{22486081596003} = 0{,}998 \quad (7)$$

There is a significant connection between the Y variable and impact factors X_i. Assessment of the overall quality of multiple regression equation involves testing the hypothesis that the coefficient of determination calculated from the population data (R^2 или $b_1 = b_2 = \ldots = b_m = 0$) is zero. This test refers to identifying the degree of non-significance of regression equation based on population data.

The conducted analysis uses Fisher's F test to perform this test. In this context, actual (observed) value of the F-test is determined, which is calculated based on R^2 determination coefficient, obtained from specific observational data.

Additionally, one can consider joint significance assumption, which means that all regression coefficients associated with the explanatory variables are simultaneously equal to zero.

To test this hypothesis, the Fisher distribution F statistic is used for one-sided testing.

If $F < F_{kp} = F_{\alpha \; ; \; n-m-1}$, then in this case there are no proper grounds for completely rejecting the H_0 hypothesis.

The value for a certain number of degrees of freedom is tabulated: $k_1 = 3$ and $k_2 = n - m - 1 = 6 - 3 - 1 = 2$, Fkp (3;2) = 19,1643.

Since the observed F value exceeds the critical value F_{kp}, this indicates the statistical significance of determination coefficient and reliability of regression equation. It is also confirmed that coefficients for X_i factors are statistically significant.

During the analysis, a multiple regression equation was obtained:

Y = 8645748,16 + 225,05 · X_1 − 8724,57 · X_3 + 159,17 · X_7

The parameters of the resulting multifactor model can be explained from economic point of view as follows:

- when the factor characteristic "Rural population" increases by one unit, the average value of the variable "Gross output of products (services) of agriculture, forestry and fisheries" increases by average of 225.05 units;

- increase in the "Average monthly nominal wage of one employee by economic sectors (agriculture, forestry and fisheries)" by one unit leads to a decrease in the average value of "Gross output of products (services) of agriculture, forestry and fisheries" by 8724.57 units;

- increase in indicator "Production of tractors for agriculture and forestry" by one unit leads to average increase in value of the factor "Gross output of products (services) of agriculture, forestry and fisheries" by 159.17 units;

- based on maximum coefficient $\beta_1 = 0.529$, we can conclude that factor "Rural Population number" itself has the greatest impact on the result of "Rural Population number" indicator.

The determination coefficient and Fisher's test confirm statistical significance of the equation. The analysis showed that in the considered case, changes in both X_j factors explain 99.81% of the total variability in the result.

The next step in using mathematical forecasting method based on time series was to carry out forecast calculations for the remaining key statistical indicators reflecting the dynamics of development of agricultural sector of Kazakhstan (table 4).

Table 4 – Forecast statistical data describing trends in the development of "rural labour potential in the Republic of Kazakhstan" for the period from 2023 to 2025

Year	Forecast	Equation Characteristics
Y – Gross output of agricultural products (services), forestry and fisheries, million tenge		
2023	10040750,67	Model equation:
2024	11151083,13	$Y = 8645748,16 + 225,05 \cdot X_1 - 8724,57 \cdot X_3 + 159,17 \cdot X_7$
2025	12261415,58	$R^2 = 0,998$ F_ calc = 327,26 Sy = 151184,08
X_1 – Rural population number, thousand people		
2023	143222	Model equation:
2024	145871	
2025		$X_1 = 118922,65 + 0,1194 \cdot X_2$
	148519	$R^2 = 0,995$ F_calc = 820,51 Sy = 496,95
X_3– Average monthly nominal wage per employee by economic sector (Agriculture, forestry and fisheries), tenge		
2023	202748	Model equation:
2024	224713	$Y = -184101,93 + 206,87 \cdot X_4 + 102,32 \cdot X_5 - 53,64 \cdot X_6$
2025	246678	$R^2 = 0,976$ F_ calc = 28,09 Sy = 13407,83
Note: table compiled by the authors		

Thus, the models presented in Table 3 describe organizational and economic mechanism of functioning of agro-industrial complex at various levels: macro and micro levels. This mechanism can be abstracted and divided into several groups: administrative (managerial), financial- economic and material - technical. Each of these groups includes factors and mechanisms that influence both on current operational activities of AIC and its modernization.

Discussions

Based on a combination of demographic, economic and social factors, it is possible to determine the role of labour resources in the structure of resource potential of the agro-industrial complex. Demographic factors include such factors as: birth rate, mortality and migration of the population, the size of the population and its labour resources. Economic conditions play a huge role in the formation of labour resources. They include the level of wages, availability of jobs and prospects for their development, as well as housing and engineering infrastructure.

Social factors, including living conditions, benefits and availability of social infrastructure, have a significant impact on social support for workers (Kydyrbaeva E.O., Baidybekova S.K., Shomshekova B.K.) [17].

In recent years, the main problem of staffing in agricultural sector of economy has been the reduction in the number of people, in particular young people, who want to work in agriculture.

The agricultural industry is experiencing a shortage of qualified agricultural personnel and, as a result, low labor productivity, low wages, etc.

As a result, most people move from rural areas to cities in search of work (National project for the development of the agro-industrial complex…) [18].

According to a number of scientists and specialists, in the near future there will be an increase in the demand for workers who have not only competencies in the field of agricultural production, but also the knowledge which is necessary to work with digital devices and robotic systems. This, in turn, it creates an urgent need for the formation and constant updating of these competencies among existing and potential industry workers (Dolgushkin N.K., Novikov V.G.) [19].

It should be noted that the potential of rural labor market is enormous. Rural territories must combine both the economy and society, and also provide them with close relationship that promotes the sustainable development of these territories. However, it is necessary to take into account that only the presence of rural economy and its growth will increase the demand for labor of the rural population, provide rural residents with increased income, level and quality of life, and increase food independence of the republic (Gizzatov A.I., Esengalieva S.M., Cheremuhina O.V.) [20].

Both quantitative and qualitative methods of analysis were used in the course of the study. Indicators of labour potential can be presented in the form of the volume of its characteristic, which includes the number of able-bodied population, as well as the amount of wages per worker at the level of productivity and intensity of labour that is established. The net aspect covers all aspects that are relevant to the intensive characteristics. It depends on the physical condition of the working-age population, as well as their education and training. This may affect the quality of factors that characterise "Gross output of products (services) of agriculture, forestry and fisheries".

Conclusions

1. The research results show that the following indicators have a significant impact on the total output of goods (services) in agriculture, fisheries and forestry: population in rural areas, average wages of workers in the agriculture, fisheries and forestry sector, as well as the availability and condition of rural housing stock, including the total area of housing. Analyses and projections of these indicators show that the population of rural areas is declining and also the increase in wages may lead to a decrease in GDP in the agricultural sector.

2. Additional ways to develop labor potential in rural areas of Kazakhstan in the context of modernization of agro-industrial complex (AIC) may include the following aspects:

2.1. Personnel development and training:

* implementation of educational programs, the purpose of which is to improve qualifications of personnel in agricultural sector;

* creation and support of professional educational centers aimed at rural residents;

* development of distance learning system to provide wider access to educational resources.

2.2. Modern technological transformation:

- application of the latest technological solutions in agricultural sector in order to increase productivity and efficiency of work processes;

- dissemination of advanced agricultural methods and practices.

2.3. Creation of jobs:

● support for development of entrepreneurship of small and medium-sized enterprises in rural areas;

● promoting the creation of new jobs by providing financial and tax preferences.

2.4. Development of social infrastructure:

* increase the level of infrastructure in rural areas, including housing and utilities services, medical care, education and cultural centres;

* creating attractive conditions for attracting specialists to rural areas, providing benefits and bonuses.

2.5. Implementation of financial support:

- provision of financial instruments and loans for development of agricultural enterprises;

- support for government programs and investments in agricultural sector.

2.6. Implementation of social programs:

● implementation of programs to support families and youth living in rural areas;

● improving social protection of the rural population.

3. The improvement of rural housing stock will contribute to the increase in the rural population, and thus to the growth of labour potential in rural areas. Forecast calculations show an increase in fixed assets in rural areas, including its active part, which is characteristic of the intensification of modernisation of the agro-industrial complex and requires an increase in the quality of labour potential.

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