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Evaluation of the effectiveness of revealing of reserves of production in the agricultural sector

This article discusses the possibility of determining the marginal product in a multi-factor production functions, the relationship of the distribution of the total social product. A purposeful study of the factors in the process of economic analysis allows to reveal reserves of production, as in every trade there are some unused opportunities to improve production efficiency, improve quality, improve the work. They are called reserves and production are divided into clear, visible, which only need to operate in the interests of production, and the hidden, reveal that by using techno-economic analysis, because such reserves are primarily untapped opportunities as factors. The article also considers socio-economic resources associated with the improving economic and moral incentives, to improve the conditions and content of work, using human factor, strengthening of the role of labor collectives in the organization and management of production. At the present stage of market transformations the special importance of maximizing the potential for improving the efficiency of production depends on what is changing are the main factors of economic growth.

Keywords: production function, reserve, model, object, factors, efficiency, rural hozaistva, national economy, industry, agrarian sector.

Currently, the main problem of Kazakhstan economy – improving innovation effectiveness. At this stage the performance in the industrial policy at the expense of technology transfer and creation of innovation infrastructure is quite obvious. Links, created to facilitate the implementation of new ideas in production, still does not give the desired effect. Open the development Bank of Kazakhstan, Investment and Innovation funds, Fund of support of small business, Center of marketing-analytical research, science Fund, venture capital funds, a number of technology parks, University research laboratories. Put the space, it, nuclear, nano-, and biotechnology.

Table 1

Investment projects in the agricultural sector in 2017, mln tenge

Investment projects in the agricultural sector in 2017		
Projects The industrialization map	3	27 969
The project is implemented through JSC «KazAgro»	2	23 360
Projects implemented outside of the industrialization Map tools	36	9850
Projects with participation of foreign investor	1	15100
All	42	55255

Note. Compiled by the authors.

On the Table 1 investment projects in the agricultural sector in 2017, there were 42 projects worth 55255 million tenge. In Karaganda region the investment project is considered Table 2 [1].

Table 2

Investments in fixed capital of agriculture in Karaganda region, (thousand tenge)

Region	2016		2017		
	Fact	% to the corresponding period usamu 2015	Yearly plan	Fact (Jan.)	Fact January 2017 January 2016
1	2	3	4	5	6
Abay	820550	124,0	1019084	15162	14,0
Aktogay	871558	830,8	1082431		

End of Table 2

1	2	3	4	5	6
Bukhar Zhyrau	2965256	152,6	3607700	22214	85,0
Zhanaarka	98111	31,7	121849	10896	
Karkaraly	108395	34,7	134621		
Nura	1615398	111,5	2006244	286811	
Osakarovka	2104930	113,3	2614218	36815	
Ulytau	75150		93333		
Shet	354041	84,0	439701		
Karaganda	40689	20	50534	41	
Temirtau	4291	11	5329		
Saran	72945		90594		
Shakhtinsk			15020		
Priozersk			15000		
Balkhash			15000		
Karazhal			15000		
Zhezkazgan	23626		29342		
Satpayev			15000		
Karaganda region	9154940	125	11370000	371935	185,0

Note. Compiled by the authors.

Of course, quick results should be expected. However, the structure of the national economy, if changing, primarily due to industrial production. It should be noted that more than 65.5 % of costs for innovative investments accounted for budgets of enterprises. These costs are brought at least 79 billion tenge of innovative products. The remaining 41.1 billion. tenge associated with the other factors [2].

However, the year 2017 has forced the domestic agricultural sector to pass a certain test to ensure the country's food supply. Because food prices rose more than 1.8 percent. In addition, while the unsatisfactory level of development of market infrastructure have deteriorated markedly productive assets of agricultural enterprises. An important problem is the financial instability of the industry. Continued migration of the rural population. Is the low security of the village with qualified personnel. In recent years aggravated the problem of structural and technological modernization of the sector. The rate of reproduction of natural ecological potential and renewal of basic production assets low. Security main types of equipment of agriculture of the Republic of Kazakhstan is several times lower than in developed agricultural countries [1].

In this regard, it is necessary to find solutions to identified problems. To this end, the establishment of mechanisms for sustainable economic growth in the country's agriculture and improve the economic performance of agricultural enterprises becomes a priority of economic policy.

As you know, still to assess the performance of individual agricultural businesses is mainly used a simple method variance. About the quality of work is judged by indices $x_{0i} - \overline{x}_0$, i = 1, 2,..., *n*, where x_{oi} — actually achieved value of the resultant variable (yield, average milk yield, the revenues per 100 ha, etc.) in the *i*-th household; $\overline{x}_0$ — is the arithmetic average value of the same characteristic in the aggregate; *n* — number of comparable companies. Enterprise for which the deviation value is positive, are recognized as working well; having a negative deflection — the running bad. Grading of assessment (normal, good, fine; weak, not satisfactory, bad etc.) is set according to the absolute value of the deviations $\left|x_{0i} - \overline{x}_0\right|$.

In this formulation, method variance is to identify and evaluate differences $x_{0i} - \tilde{x}_{0i}$, where $\tilde{x}_{0i}$ — the calculated (theoretical) value of the resultant variable obtained by consideration of the most important factors of production for the *i*-th enterprise.

Simplistically, value $\tilde{x}_{0i}$ can be calculated even without the use of economic-mathematical methods, such as group averages of the combined groups on the basis of standard calculations, etc. However, if the number of aggregated factors of more than two, their impact on the productive criteria is most appropriate to study using regression analysis, as discussed in the first Chapter of this study.

To do this, we construct a model $x_0=f(x_1; x_2; \ldots; x_k)$, where $x_1; x_2; \ldots; x_k$ — the main factors of production. It is often called the production function.

Some researchers impose very stringent demands on models of the relationship, believing that the model of the wealthy and healthy only when it contains all the basic factors of production without exception. In the limiting case of this concept leads to the concept of the «ideal production function». As the latter, in practice, indefinable, a real life relationships are seen as to some extent offset display perfect function.

Such approach allows to avoid simplistic and superficial approaches to solving the problem, but it can lead to the separation of production functions from the traditional economic indicators and calculations.

Limiting «factors» complexity of the models, which would be real from the point of view of economic theory, readiness of developers and computational capabilities of computers are likely to be the volume, accuracy and precision of the original data. For this reason, the number of factors in multivariate regression equation is usually in the range from 3 to 8.

In addition, you should consider the level of training of specialists of the industry, which are mainly developed statistical materials. For availability analysis is often necessary to choose a linear form ties.

The main objective of the analysis is an objective assessment of each enterprise. Therefore, all deviations of the actual data from the arithmetic mean should be split into two groups. The first will include those which are explained by various objective factors of production. These factors in turn can be represented as the deviation of actual levels from the average of the aggregate: $(x_{1i} - \overline{x}_1)$, $(x_{2i} - \overline{x}_2)$, ..., $(x_{ki} - \overline{x}_k)$. If the form of communication is linear, then explained part of the variance of the effective feature can be represented by a sum of products

$$\sum_{j=1}^{k} b_j (x_{ji} - \overline{x}_j), \quad i = 1,2,...,n, \tag{1}$$

where b_j — is the coefficient of the multivariate regression of the *j*-th factor; *k* — is the number of factors in the equation.

The coefficients of the multivariate regression equations characterize the relatively pure effect of the factors with *(k-1)-th* level of conditionality. Individual work $b_j(x_{ji} - \overline{x}_j)$ characterizes the average deviation of the effective feature from the arithmetic mean due to the variance of the *j*-th factor from their arithmetic mean value.

The calculated (theoretical) value for the resultant variable is defined by the formula

$$\tilde{x}_{0i} = \overline{x}_0 + \sum_{j=1}^{k} b_j (x_{ji} - \overline{x}_j), \quad i = 1,2,...,n. \tag{2}$$

The second group consists of those deviations that cannot be explained using multivariable regression. They are determined by subtracting from actual values of the effective feature corresponding to the calculated (theoretical) value $x_{0i} - \tilde{x}_{0i}$.

If the deviations $x_{0i} - \tilde{x}_{0i}$ are the basis of evaluation of work of the enterprise or industry, the regression equation should include all the factors that affect the production results but which are not weakly amenable or amenable to management at the level of the enterprise or industry. Organizational or subjective factors of production are manageable at this level, the equation should not be included even if: they are known; available necessary to describe the original data; their recording would significantly increase the overall correlation coefficient. Failure to comply with the last premise leads to a distortion of the economic content of the deviations $x_{0i} - \tilde{x}_{0i}$.

In particular, in the detection of reserves of increase of efficiency of agricultural production need to keep in mind that yields of the main crops is one of the most important indicators of crop development and, to a large extent, the results of operations as a whole. Yield is a complex biological and economic characteristics, the magnitude of which is influenced by both natural and economic, and organizational factors. Therefore, the study of the influence of the main factors of production on yield has a special importance.

These and other similar challenges arose and were put before the people for a long time. Despite this, agricultural Economics, and to date, has not yet sufficiently accurate methods of calculating the level of planned targets not only in the long term, but for the coming year. In agriculture, these unresolved problems are many and also appear new. Consequently, it is important to develop new methods and techniques for their solution [2].

It is known that only through the study of causal relations is the knowledge of the universal connection of phenomena occurring in nature and society. In the Economics of agricultural production relations

manifests itself everywhere, which are also caused by. For example, the value of the yield is influenced by the availability of moisture and nutrients in the soil, seed quality, level of farming, etc.; the animal productivity is affected by their age, breed, level of feeding, system maintenance, etc.; the unit cost is subject to factors such as productivity (productivity), the level of mechanization, etc. Yield, productivity, cost and factors affecting them quantitative side, act as variables, the relationship between them in General form can be expressed by the equation:

$$Y = f(X_1, X_2, ..., X_n), \quad (3)$$

where Y — is the resultant characteristic (the dependent variable); X_1,X_2, . . ., X_n KHP-factorial traits (independent variables) influencing the result of production.

The first attempts of practical application of production functions in agriculture belong to the XIX century, in 1840 the famous German chemist J. von Liebig put forward the theory of mineral nutrition of plants, which largely contributed to the introduction of mineral fertilizers in agriculture. Using the idea that crop yield (y) is determined by the factor that is in minimum, the von Liebig fertilizer efficiency was modeled by the following production function:

$$y = ax, \quad (4)$$

where x is the amount of mineral fertilizers; a - influence of fertilizers on yield [2].

But crops are known to bring a certain crop without fertilizers. So it was later introduced a constant (C) and the model took the form

$$y = c + ax. \quad (5)$$

Over time, the production function (5) detailed the types of fertilizers and it became a multi-factor:Over time, the production function (5) detailed the types of fertilizers and it became a multi-factor

$$y = c + a_1x_1 + a_2x_2 + ... + a_nx_n, \quad (6)$$

where n is the number of types of used fertilizers.

But the production function (6), despite the modification, did not meet the requirements. In particular, it did not predict the maximum level of crop yields. Joint research agronomists, mathematicians and statisticians has led to the emergence of a number of more complex dependencies.

In particular, at the time, gained fame production function Mitscherlich of Spielman, which was proposed in 1909:

$$y = M - AR^x, \quad (7)$$

where M — is the maximum crop yield; A — the most responsiveness culture for fertilizers; R — the rate of reduction in the efficiency of fertilizer; x — amount of fertilizer.

Production function Mitscherlich-Spielman was more perfect, but also not devoid of certain drawbacks.

British researchers IETS and Crowther as a result of processing of the experiments on fertilization in England in 1900-1914 he received a production function that has the form

$$y = y_0 + A(1 - 10^{-kx}), \quad (8)$$

where y — yield crops; y_0 is the yield per unit area sown without fertilizer; A — max imum yield increase from fertilizers; K — is a constant for each type of fertilizer.

The number of known modifications of the function of Atsa and Crowther, but they rarely yield acceptable results [2].

This is because all of the above production function yield are unilateral in the sense that they take into account only fertilizer. The level of productivity of agricultural crops depends not only on the quality and quantity of deposited mineral and organic fertilizers, but also from a number of other factors. A great influence on the yield from 1 ha of crops are caused by meteorological conditions and especially the availability of moisture, soil fertility, seed quality, level of farming, etc.

Significant research on the impact of meteorological factors was performed by the famous Russian statistician, V. M. Obukhov. In the course of the study were obtained production function characterizing the dependence of the yields of rye grain (y) the amount of moisture at certain periods of the growing season. This function had the following form:

$$Y = -5{,}9766 + 0{,}2452\,x_1 + 0{,}1506x_2 + 0{,}2989x_3 + 1{,}3004x_4 + \\ + 0{,}2770x_5 + 0{,}0186x_6 + 0{,}5040x_7 + 0{,}3059x_8 - 0{,}2233x_9, \quad (9)$$

where x_1 is the amount of winter precipitation, including late autumn and early spring; x_2 — the presence of moisture in the early growing season of rye; x_3 — the amount of moisture in the subsequent time; x_4, x_5 — availability of moisture in the initial and end periods, output of rye in the tube; x_6, x_7, x_8 x_9 — amount of moisture, respectively, in the heading, flowering, rye, during the grain formation and during its maturation.

Given a production function with high enough accuracy for practice simulated dependence of productivity from the level of moisture in a separate growing periods.

We set out the main stages of development of studies on the use of production functions in order to plan crop yields. But the same phases is the use of these functions and solve other important issues of agricultural production.

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Аграрлық секторындағы экономикасының өндірістің резервтерін анықтау тиімділігін бағалау

Мақалада қоғамдық өнімнің жиынтығын таратуға байланысты көпфакторлы өндірістік функцияларда шекті өнімнің анықтау мүмкіндіктері зерттелген. Экономикалық талдау үрдісінде факторларды мақсатты зерттеу өндірісті тиімді арттыру, сапаны жетілдіру, жұмысты жақсартуда қолданылмаған мүмкіндіктерді анықтау әрбір кәсіпорындары резервтерін айқындауға мүмкіндік берді. Оларды өндіріс резервтері деп атайды және айқын, көрінетін деп бөледі. Оларды техникалық-экономикалық талдау көмегімен негіздеуге болады, немесе мұндай резервтер факторлардың қолданылмаған мүмкіндіктерін ретінде анықталады. Мақалада сонымен қатар экономикалық және моральдік ынталандыру, еңбек қызметі жағдайы мен мазмұнын жетілдіру, адами факторды қолдану, ұйым мен өндірісті басқаруда еңбек ұжымының рөлін жандандыруды жетілдірумен байланысты әлеуметтік-экономикалық резервтер есебінде қаралады. Қазіргі кезеңде нарықтық қайта құруларды ерекше маңыздылығы экономикалық өсудің негізгі факторымен бірте-бірте өзгеруімен алдын ала анықталатын өндірістің тиімді арттырылуы үшін резервтерді максималды іске асыру қарастырылған.

Кілт сөздер: өндірістік функция, резерв, модель, объект, факторлар, тиімділік, ауыл шаруашылығы, ұлттық экономика, кешен, аграрлық сектор.

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Оценка эффективности выявления резервов производства в аграрном секторе экономики

В статье показаны возможности определения предельного продукта в многофакторных производственных функциях, отношения распределения совокупного общественного продукта. Целенаправленное изучение факторов в процессе экономического анализа позволяет вскрыть резервы производства, так как в каждом производстве имеются определенные неиспользуемые возможности повышения эффективности производства, совершенствования качества, улучшения работы. Их называют резервами производства и подразделяют на явные, видимые, которые только необходимо привести в действие в интересах производства, и скрытые, выявить которые можно с помощью технико-экономического анализа, ибо такие резервы проявляются прежде всего как неиспользованные возможности факторов. В статье также представлены социально-экономические резервы, связанные с совершенствованием экономического и морального стимулирования, улучшением условий и содержания трудовой деятельности, использованием человеческого фактора, усилением роли трудовых коллективов в организации и управлении производством. На современном этапе рыночных преобразований особая значимость максимальной реализации резервов для повышения эффективности производства предопределяется тем, что постепенно меняются главные факторы экономического роста.

Ключевые слова: производственная функция, резерв, модель, объект, факторы, эффективность, сельское хозяйство, национальная экономика, комплекс, аграрный сектор.

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