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**ASSESSING THE IMPACT OF RESOURCE POTENTIAL ON THE  
RESULTS OF AGRICULTURAL ACTIVITY**

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*Abstract*

The article discusses the theoretical and practical aspects of assessing the resource potential of agricultural enterprises: its formation and effective implementation. The functioning of any enterprise depends on the expedient formation and effective use of all limited and, to a certain extent, interchangeable resources. The competitiveness of agricultural enterprises is formed in a diverse, fairly aggressive external environment. This brings the concept of resource potential to the category of production (economic) potential. This article clarifies the meaning of the concept of "resource potential" from different points of view, by which the authors, as a rule, imply a set of resources of agricultural enterprises. The role of innovation processes in agriculture is identified; problems of their implementation are revealed. The main problems of Russian realities in the process of formation and operation of the resource potential of agricultural production are considered. The existing methodological approaches to the assessment of the components of the resource potential and the influence of factors on the effectiveness of its use are summarized and analyzed. An algorithm for the integrated assessment of the resource potential of agricultural enterprises in the region is proposed. On the basis of the formed base of statistical and analytical data, the regression equations for different moments of time reflecting the degree of influence of the most significant factors are constructed. The results of the study indicate the feasibility of using linear programming models to develop plans to optimize the functioning of the resource potential of agricultural enterprises in the region.

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**Keywords:** Assessment methods, competitiveness, innovation processes, resource potential, resource saving, sustainable development of enterprises.



## 1. Introduction

In the rapidly improving economic and regulatory conditions, the agricultural sector in both international and Russian practice faced the problem of optimizing and introducing such systemic elements as: financial flows, innovative technologies, the level of competence and activity of staff. The end result of the problem solving is the formation of an expedient structure of the resource potential of agricultural enterprises, an increase in the efficiency of its use and, as a result, the sustainable development of the industry.

The expansion of the production potential of agricultural production and its basis, the resource potential, is directly related to innovative development, as evidenced by regional and federal government programs in which the development and introduction of innovations in various sectors of the economic complex are of particular importance.

The specificity of innovation processes in agriculture is due to a number of reasons such as territorial, sectoral, technological, functional, organizational, and regulatory differences in the regions. Those or other features of the subjects can have both positive and negative effects on the existing and emerging innovation processes in the industry.

## 2. Problem Statement

**2.1.** In the process of formation and use of high-quality resource potential, economic actors are increasingly confronted with factors constraining the pace of innovative development of the agricultural sector and the growth of its economic, social and environmental efficiency:

- relatively weak cooperation of agricultural enterprises with scientific organizations and institutions, the inability to promptly introduce innovations in production;
- insufficient staff qualifications that do not meet the requirements of modern agricultural production technologies, low wages in certain industries;
- inefficient public administration, planning and forecasting, substitution of effective management by elementary administration;
- insufficient financing of innovative projects and research in the field of agriculture;
- imbalance of resources and their inefficient interchangeability; morally and physically obsolete fixed assets;
- an insignificant degree of reproduction of the natural potential (Garipov, Gizatullin, & Garipova, 2016).

These and many other, in the first place, external challenges require a systematic and comprehensive analysis of the basis for the sustainable development of agricultural production — resource (production) potential.

At the same time, the analysis of the economic condition of the Novgorod region allows us to note positive trends in the field of innovative development of agriculture:

- the availability of free natural resources suitable for the future inclusion in the composition of the resource potential of the region;
- flexible and capacious market for food products in the presence of emerging positive demographic trends, growing demand for products of domestic producers;
- availability of the necessary technologies, methods and means for the production of environmentally friendly and healthy foods;
- development in the agricultural sector the information management system.

**2.2** The resource potential of an agricultural enterprise should be considered as a complex, constantly functioning, dynamic system that provides not only socially oriented agricultural production, but also its own reproduction.

The fundamental point of the study of the economic category of "resource potential" is the unity of the elements, their balance and proportionality.

At the same time, it should be understood that the specificity and mandatory elements of the potential of this industry are natural and climatic conditions, environmental and sanitary-epidemiological factors, the quality of land and soil resources, the location of the region relative to other territorial units.

For the planned and balanced innovative development of agriculture in the regions and, as a result, the effective use of the resource potential, the development and operation of a theoretically and practically effective set of support measures, stimulating innovation in agricultural production, is required of the state. This aspect will expand the possibilities of fundamental research and constructive innovative developments, thereby accelerating the pace of scientific and technological progress, which will naturally lead to sustainable development of agricultural production in the region as a whole (Neganova & Dudnik, 2018).

**2.3** In addition to the innovative nature of the development of the resource potential, special attention should be paid to the main areas of resource conservation in agriculture. Among them are:

- mechanization of production - increasing the durability, reliability and efficiency of operation of machinery and equipment by improving their design features, the use of small-sized agricultural machinery;
- technical service - improvement of a set of measures for maintenance of machinery and equipment, development of methods for saving fuel and lubricants;
- introduction and operation of economically advantageous technologies in animal husbandry and crop production, the use of additional working equipment to reduce energy intensity and improve the quality of work;
- use of technologies of multiple use of renewable resources in the processing and storage, the transition to non-waste production, the formation and operation of additional plants for processing recycled materials, improving the safety technologies of manufactured products (Makarov, Ayvazyan, Afanasyev, Bakhtizin, & Nanavyan, 2016).

### **3. Research Questions**

In the presence of existing methods for assessing the efficiency of using the resource potential of agricultural production in the region, there is a difficulty in comparing the results of analysis of two or more objects, since each subject of analysis uses the method that he or she considers most objective and accurate.

In the realities of the modern economy, many organizations focus on the research literature, which deals with thematic analyses, their differences and advantages. As a rule, in the literature there is one method that has a clear qualitative advantage. Thus, the scientific literature forms a unified methodological approach, which all participants must adhere to. Other methods are applied individually in order to obtain the most objective, detailed result.

The questions of interpretation, analysis and assessment of the economic efficiency of the use of the resource potential were addressed by foreign and domestic researchers. V.N. Ovchinnikov, Yu.P. Alekseev, V.V. Miloserdov, V.N. Arkhangelsky, S.D. Valentey, N. A. Volgin, Yu. I. Lyubimtsev, K. I. Pletnev, P. D. Polovinkin, A. N. Folomev dealt with the study of the development of individual components of the resource potential of the country, regions, industries and their effective use.

Analysis of the approaches available in the scientific literature to the definition of the resource potential identifies it with an interconnected set of material, energy, information resources and workers who participate or can be used in the production of material goods and services. Thus, the resource potential of agricultural production is considered as a set of a certain amount and quality of resources necessary for the expanded reproduction of the ecological-socio-economic system, which determine the maximum amount of the total social product of the agrarian sector for the current and future provision of the population of the region with food, as well as some types of raw materials industrial enterprises.

The terms "resource and production potential" in scientific research, as a rule, are used in relation to the subjects of the Russian Federation, economic regions and the country as a whole. The fundamental element of these entities is the enterprise. In this connection, the terms are applicable to it as well (Makarov, Ayvazyan, Afanasyev, Bakhtizin, & Nanavyan, 2016).

Approaches to the interpretation of the concept of resource potential, evaluation of its elements and the effectiveness of the functioning in the economic literature differ. The issues of optimizing the structure of the resource potential and the efficiency of its use in agricultural enterprises of various forms of ownership and organization of business, taking into account regional peculiarities, require further research and continuous monitoring.

### **4. Purpose of the Study**

The aim of the study is to form the most appropriate mathematical model for factor analysis of the performance of the resource (production) potential, which allows to establish the nature and closeness of the relationship between the resultant mark - the value of gross output, and its formative factors - elements of the resource potential.

The authors of the study suggest that the formation of an optimal production structure of resources and the functioning of the resource potential of agricultural enterprises in the region as a factor of

competitiveness and sustainability of development require consideration of local peculiarities and will be effective if the most significant factors of the internal and external environment affecting the economic, social and ecological state and development of rural areas are studied and determined.

An integrated approach to developing a system of measures to optimize the structure and increase the efficiency of the resource potential of agricultural enterprises will reduce the resource intensity of agricultural production. At the same time, it is necessary to note the positive impact of the introduced technologies on various aspects of activity: comfortable working conditions, improvement of the social and ecological situation of individual places and the region as a whole, preservation and renewal of natural resources, increment of production capacities and growth of profitability of enterprises.

## **5. Research Methods**

Since the resource potential has such important characteristics as complexity and consistency, it should be considered from different points of view, namely, balance, sufficiency, dynamism. These characteristics of the resource potential determine the quality of products, rhythm, cost of production and sales of products, and as a result, the competitiveness of the enterprise. In this regard, the methodological basis of the study was a systematic and integrated approach. Both approaches have significant methodological potential and allow the use of multiple methods and techniques of economic analysis. The basis of using these approaches is the recognition that the production of various types of agricultural products requires the investment of resources in various proportions. A significant set of sectors of agricultural production within one enterprise allows production in a fairly wide range of units of each of the invested resources. At the same time, one or another structure of the resource potential determines the unequal result for enterprises with similar specialization and being in similar natural and climatic conditions. This fact determines the search for the optimal structure of the resource potential. The use of these approaches allowed to study the state, problems and trends in the development of the resource potential of agricultural producers by the example of the region, to form a mathematical model to determine the degree of influence of the components of the resource potential on the results of agricultural production, and thus to identify reserves for increasing the efficiency of using the resource potential as the basis of the production potential agricultural enterprises of the Novgorod region.

To achieve the objectives of the study, the following methods were used: theoretical analysis of the economic literature on research issues; methods and techniques of economic and statistical analysis.

## **6. Findings**

There are 221 agricultural enterprises of various forms of ownership in the region, most of which are located in the Starorussky, Borovichsky, Pestovsky and Novgorod districts. The largest share in the production structure is accounted for by agricultural organizations (58.5%), 10.6% - by peasant (farmer) farms, by households - 30.9%.

The prospects for the development of agricultural production are based on the state program "Sustainable development of rural areas in the Novgorod region for 2014-2020", the main purpose of which is to stimulate investment activity by providing all the necessary conditions in rural areas.

In 2017, 5,412.7 million rubles were allocated to the implementation of the state program, including: from the federal budget - 574.1 million rubles, or 100% of the planned amount of funding; from the regional budget - 542.1 million rubles, or 99.5% of the planned amount of funding. 4296.5 million rubles were spent from extrabudgetary sources.

68 agricultural organizations, 162 peasant (farmer) farms, 78 private farms received state support.

To understand the current level and prospects for the development of agricultural production in the region, an analysis was made of the efficiency of using the resource potential, and the degree of influence of its components on the resultant attribute was established. For this purpose, the correlation-regression analysis, as a modelling method, was used.

As a generalizing effective indicator in the model, the output of marketable agricultural products per 100 hectares of agricultural land was used. In market conditions, it is more expedient to consider the result as an indicator of agricultural commodity per unit area. The argument in favor of the selected indicator is the fact that in agricultural production a significant part of the products produced is not sold, but reused in the production process (Anfinogentova, Dudin, Lyasnikov, & Protsenko, 2017).

Economic and mathematical modeling allows us to establish the dependence of the resultant factor (gross output per 100 hectares of agricultural land) on independent variables. In the period of the 90s, the model had the following form:

$$Y = -22.465 + 0.75 \cdot X1 + 0.441 \cdot X2 - 9.66 \cdot 10^{-3} \cdot X3 + 5.737 \cdot X4 \quad (1),$$

where Y is the gross output per 100 hectares of agricultural land, million rubles;

X1 – point of land quality, point;

X2 – cost of working capital per 100 hectares of agricultural land, thousand rubles;

X3 – the cost of basic production assets per 100 hectares of agricultural land, thousand rubles;

X4 – the number of employees per 100 hectares of agricultural land, people.

It should be noted that the analysis of the materiality of the influence of the factors introduced into the equation on the resultant feature showed the need to exclude the third indicator - the cost of basic production assets, since it has an insignificant effect on the final result. The inefficiency of raising additional fixed assets is understandable. At the time of the 1990s, the economic situation, both in the country as a whole and in the region in particular, was extremely unsatisfactory. Outdated morally and physically, the fleet of agricultural equipment, the lack of qualified repair service, rather high prices for parts and new equipment - all this caused great damage to the existing production. Therefore, this factor can be excluded from the model, and the final equation will take the following form:

$$Y = -22.199 + 0.701 \cdot X1 + 0.403 \cdot X2 + 5.802 \cdot X4 \quad (2),$$

In the equation, the constant has a value of -22.199 and reflects the level of fixed costs incurred by agricultural enterprises, provided that there is no result - gross output. Interpretation of the obtained mathematical model allows us to judge that the most significant impact on the final result is exerted by such elements of the potential as the number of employees of agricultural enterprises and soil quality.

According to the model, an increase in the number of workers per person per 100 hectares of agricultural land will lead to an increase in gross output by 5.802 million rubles. In turn, improving the quality of land resource by one point will increase the volume of gross output by 0.701 million rubles.

The relationship between gross agricultural output and land quality is obvious: an increase in fertility leads to an increase in the productivity of arable land and other land. In accordance with this regression equation, land is a key resource for agricultural production for the period of the 1990s.

The high correlation coefficient for such factor as the number of personnel in the industry indicates an inefficient approach to the use of labor, which is a consequence of the extremely low wages during this period and, consequently, low motivation of workers in the first place. Inadequate working conditions, abundance of routine operations, extremely tense work periods, lack of a normal infrastructure - all of this also adversely affected the work efficiency. The analysis performed is indicative of the preferential implementation of the extensive development path.

The regression equation showed that an increase in the volume of working capital by one thousand rubles will lead to an increase in gross output by 0.403 million rubles per 100 hectares of agricultural land. At the same time, an increase in the volume of fixed assets will be ineffective, as it will lead to a decrease in the value of the product produced. An analysis of the interpretation of the results makes it possible to judge that the attraction of additional working capital would have a positive impact on the results of agricultural production. In the 1990s, an increase in working capital would have been extremely necessary. However, it was not possible to satisfy this need due to a complex of economic, administrative and regulatory conditions.

Retrospective analysis allows us to objectively assess the current state of the resource potential of the industry. The mathematical model is as follows:

$$Y = -22.015 + 0.63 \cdot X1 + 0.478 \cdot X2 - 7.21 \cdot 10^{-3} \cdot X3 + 3.183 \cdot X4 \quad (3)$$

The economic interpretation of the resulting equation is as follows. According to the constant equal to -22.015, it can be concluded that the level of fixed costs in comparison with the period of the 1990s has slightly decreased. In other words, the volume of costs in the absence of a result for enterprises decreased.

A comparative analysis of the regression equations provides insight into the tendency of variables to equilibrium. However, the unstable economic, political situation, administrative obstacles can significantly change the total figures. This shows certain advantages of the selected model of economic and mathematical analysis of the effectiveness of using the actual and predicted resource potential of agricultural enterprises in the region.

The gradual increase in the efficiency of land use reduced its impact on the gross product. Thus, in accordance with the equation, an increase in soil fertility by 1 point per 100 hectares of agricultural land will lead to an increase in the product by 0.63 million rubles. In turn, an increase in the number of employees per employee will ensure an increase in the value of gross output by 3.183 million rubles. That is, the role of land and labor factors is gradually leveled and in the model tends to equilibrium. This is

primarily due to the introduction of modern automated and computerized technologies into the production of some branches of agriculture. Thus public interest is realized.

The decrease in the impact of land quality on the final result can be explained by the use of more modern and high-quality working capital in the form of feed, fertilizers, seed and planting material, etc., as evidenced by the increase in the coefficient of variable X2 (working capital). According to the equation, an increase in one thousand rubles of consumed working capital will lead to an increase in gross output by 0.478 million rubles, which means a more intensive nature of agricultural production.

Reducing the period of bringing scientific achievements to agricultural production, improving the quality of fixed assets used, improving their species and functional structure, increasing the share of the active part, improving the assembly of agricultural equipment and improving the repair business led to a slight decrease in the negative impact of this factor on the resultant indicator (Altukhov, Drokin, & Zhuravlev, 2016).

## 7. Conclusion

A factor analysis of the formation and efficiency of the use of the resource potential of agricultural enterprises has shown a gradual transition of agricultural production to an intensive development path. With an expedient approach to the formation and use of the resource potential as the basis of the production potential, there will be a steady and systematic increase in the volume of output and improvement of its quality in the industry.

Economic analysis requires taking into account factors unused in a mathematical model, the degree and frequency of influence of which is difficult to establish, for example, adverse climatic conditions, emerging focal diseases of farm animals and some others.

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