Financial model for solving environmental problems in agriculture

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Abstract. Adverse impact on the environment and humans is one of the important tasks of modernizing agriculture and ensuring state security, rational use of resources to preserve the ecological environment. Improving the profitability of agriculture on the condition of reducing the use of fertilizers and biocides to solve ecological problem. The availability of resources (agricultural land) changes in conditions of scarcity. In this article, we consider factors for assessing the rational use of land resources, crop production technologies in achieving the goals of developing a "green" economy. The factors of analysis in this study determine the prospects for farming, in terms of results. A linear programming model shown to analyze alternative rural development systems. The result of our research helps to develop ecological policies aimed at updating agricultural practices. The availability of resources such as agricultural land, water is decreasing, among other things, due to environmental problems faced by the state. Rapid economic development and rising living standards lead to an increase in demand for more luxurious and varied food. In particular, the demand for animal products such as goat and sheep meat, beef and milk is growing rapidly, while the efficiency of using resources (especially land and water) for food production in livestock production is much lower than in crop production.

1 Introduction

The purpose of this study is to assess economic factors that can help to explore the implications of different agricultural policy stewardship strategies. The indicators for analysis in our model are the profit of the agricultural industry, food security factors, and the land use assessment system. This article can present a model, empirical results, an assessment of economic factors and a conclusion. The economic linear model shows the rational use of agricultural resources in terms of ecological safety. In our study, we show environmental issues in a broad sense, allowing us to explain various types of resource exploitation, social and environmental

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degradation, as well as technologies and fertilizers. Environmental degradation is assessed as a result of the socio-economic environment.

The use of technology further worsens the environmental situation, environmental degradation sets in, which does not provide incentives to improve the conditions for the rational use of agricultural resources. Factors of the economic, social and institutional environment have an impact on ecology. The use of technology further worsens the environmental situation, environmental degradation sets in, which does not provide incentives to improve the conditions for the rational use of agricultural resources. Factors of the economic, social and institutional environment have an impact on the environment.

However, the concept of rational use of resources remains the main one in our study, where we determine the economic factors of efficiency and their target values. An analysis is made between capital and natural resources capital (fossil resources). The stock of capital cannot decrease; it is possible to replace them with artificial stocks. Sustainable consumption is achieved when natural capital is replaced in a resource-saving manner. Efficient sustainability should be sought, may also depend on ecology. However, in some conditions, access to rhenium is limited; it may be impossible to compensate for the loss of natural fertility with fertilizers [4].

2 Methods analysis and assumptions

Under the new economic conditions, the capitalization of resource-saving industries has become profitable. Contributes to solving ecology problems in agriculture. The area of arable land is shrinking by 20% per year due to industrialization, and the demand for a green economy is growing. Demand for eco-resources is growing, and the prospects for market networks are favorable. Part of the rural population is migrating to urban centers and the labor force is shrinking. The accelerated pace of economic development is a problem for the agro-ecosystem from a socio-economic point of view. It is necessary to highlight those economic factors that reduce risks. In our study, various modeling methods were chosen. We chose those economic factors that can be broken down into criteria into variables.

In the course of the study, we combined socio-economic attributes and indicators of economic growth in terms of resource substitution for ecology friendly ones [6].

Most of the rational decision problems arising from socio-economic factors were based on ecology indicators. To assess the understanding of interactions, the article indicates an estimated linear method and information of the studied area with economic factors influencing them [1].

The assessment was based on the empirical findings of the study, the factors and problems of the modern agro system were identified. The study explored the possibilities of improving the environmental problems of the modern system of agriculture. The linear model helps to improve methods of agricultural optimization and rational use of resources. The analysis of the factors influencing the resource base was carried out, and its features were analyzed on the basis of the economic indicators of the agro ecosystem. An analysis was also made of the management of replaceable resources for environmentally friendly ones. Based on the evaluation of the data, the prospects for a "green" economy were determined. At the last stage of the study, conclusions are presented.

3 Model construction

3.1 Practice for optimization

In modern conditions, a large number of scientific studies have been devoted to assessing the feasibility of a project in agriculture based on the use of mathematical calculations of the effectiveness of relative indicators, however, the methods, models and algorithms proposed so far do not allow formalizing many emerging situations and thereby solving these problems. Often, the effectiveness of a project in agriculture is assessed mainly on the basis of processing economic and financial indicators. The article adopts a hypothesis about the need to develop and implement new projects for small agricultural firms capable of operating in a changing environment.

The main focus is on sustainable development, in which the project retains its functions not only in the economic, but also in the social and environmental spheres [5].

The basis of the effectiveness of the project feasibility in agriculture is determined by mathematical calculations of the main economic indicators, which were calculated, among other things, by the linear scaling method. A common disadvantage of the existing approach is the need to use quantitative initial data. However, every project, in addition to quantitative ones, is characterized by a variety of qualitative input data, which create immeasurable uncertainties that must be taken into account in the assessment. In the calculations, it is also necessary to take into account the hazard conditions for the complete or partial loss of the invested resources.

3.2 Description of the model

These circumstances force, firstly, to adapt quantitative characteristics to the possibility of using them with qualitative indicators, and, secondly, to use mathematical programming that can handle various types of uncertainties and maintain a balance between economic, social and environmental indicators. The article proposes the formulation of the problem of assessing the feasibility of a project in agriculture based on the use of the mathematical apparatus of soft computing. The choice of methodological techniques and the scope of research were determined by the goal and objectives of this work. To solve the set tasks, the agricultural regions in different countries.

Let us consider separately how the forecast results are calculated for the main types of crops, and also give the used formulas for their calculation.

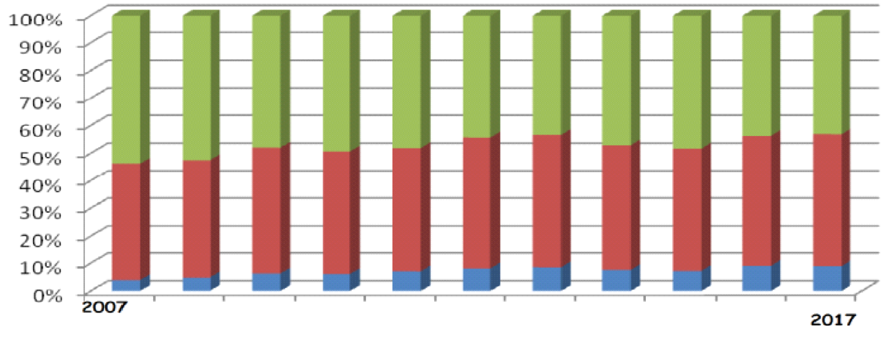

Fig. 1. Structure of agricultural production

In Fig.1, we will look at the structure of agricultural production, where large agricultural production companies are shown in red, personal subsidiary plots are shown in green and small agricultural firms (farmers) are shown in blue. This figure is the basis for mathematical calculations of the mathematical model, the formulas of which for various crops are presented in Fig. 2. [3]

Scientists-economists do not have a single view on the assessment of control over the effectiveness of agricultural development in small firms. Some adhere to the point of view that it is necessary to use absolute indicators for calculating efficiency], while others for calculating relative indicators.

We share the position that the estimate is a relative value, therefore, by calculating the ratio of some indicator (for example, the sum of detected deviations from the established norms) to the costs of financing and developing agricultural small firms.

$S_{wh_i} = \frac{S_{wh_{i-1}} \cdot S_{gr_i}}{S_{gr_{i-1}}}$	$m_{wh} = \frac{m_{wh_{i-1}} \cdot m_{gr_i}}{m_{gr_{i-1}}}$
$S_{rye_i} = \frac{S_{rye_{i-1}} \cdot S_{gr_i}}{S_{gr_{i-1}}}$	$m_{rye} = \frac{m_{rye_{i-1}} \cdot m_{gr_i}}{m_{gr_{i-1}}}$
$S_{corn} = S_{corn_{2008}} \cdot A_p + 200 \cdot A_{pec}$	$m_{corn} = m_{corn_{2008}} \cdot A_{p(yp)}$
$S_{sf} = S_{sf_{2008}} \cdot A_p + 2000 \cdot A_{pec}$	$m_{sf} = m_{sf_{2008}} \cdot A_{p(sf)} + 4$
$S_{sb} = S_{sb} \cdot \sqrt{A_{pec} \cdot A_p} + 90$	$m_{sb} = m_{sb_{2008}} \cdot A_{p(sb)}$
$S_{flax} = S_{flax_{2008}} \cdot \sqrt{A_{pec} \cdot A_p} + 2$	$m_{flax} = m_{flax_{2008}} \cdot A_{p(flax)}$
$S_{pt} = S_{pt_{2008}} \cdot \sqrt{A_{pec} \cdot A_p} + 60$	$m_{pt} = m_{pt_{2008}} \cdot A_{p(pt)} + 15$
$S_{vg} = S_{vg_{2008}} \cdot A_p + 100$	$m_{vg} = m_{vg_{2008}} \cdot A_{p(vg)}$

Fig. 2. Formulas for calculating the influence of economic factors on the rational use of agricultural resources

3.3 Rational approach to solving ecology problems of agriculture

The schematic model shown in Figure 3 is an empirical basis for the mathematical logic of calculating the feasibility of a project in agriculture.

A number of innovations that can be considered a technological innovation. These data served as the basis for constructing three-dimensional models of the relationship between the number (Q factors) of factors invested in the efficiency and financing (P) of agricultural firms by the government.

The economic model of mathematic logic is based on the initial assumption that the availability of land is not a mandatory constraint for pegging the income of an agricultural small firm. Thus, our model uses three main forms of interpretation, according to which the factor of land is considered constant so that other factors, especially external factors, can be carefully evaluated.

The mathematical model has 3 main forms of interpretation. The first most common is the Graphic Form. The graph reflects a visual dependence in the form of diagrams, diagrams, equivalent parameters, etc. The second form of interpretation is algorithmic. Algorithmic form is written sequentially in the form of an algorithm, which makes it possible to correlate the selected numerical parameters. The algorithmic form also includes a simulation, which allows you to evaluate the impact of external processes on the selected object. The third form is analytical. It allows you to establish dependence on the desired parameters, usually the dependence of the output parameters on the internal ones. By integrating differential equations, it is easier to determine the optimal values of such a model.

By the nature of the displayed properties, mathematical models are divided into: functional and structural. The functional model takes into account the functional properties of the selected object, which makes it possible to determine new parameters using synthesis. Such a model describes the technical capabilities of the object and includes a set of systems of equations. The structural model reveals the features of the design input parameters that make up a technical object, which makes it possible to establish the differences between one structure of an object from another structure. This allows the most complete display of the structure of the object in the interaction of structural synthesis. In order to determine the effective indicator of financing small agricultural firms, we use the construction of a correlation model. A correlation model is a mathematical model in which an average value is formed based on the influence of several factors. The construction of the model will be carried out in the following stages:

1) Selection of the effective indicator;
2) Gathering the necessary information;
3) Selection of the type of correlation model;
4) Calculation of parameters and their description.

4 Empirical results and analysis

The conducted modeling and analysis of agricultural activity in modern conditions in some regions of the EU showed a significant share of small agricultural firms and the prospects for their effective activity and improved financial performance (Fig. 3).

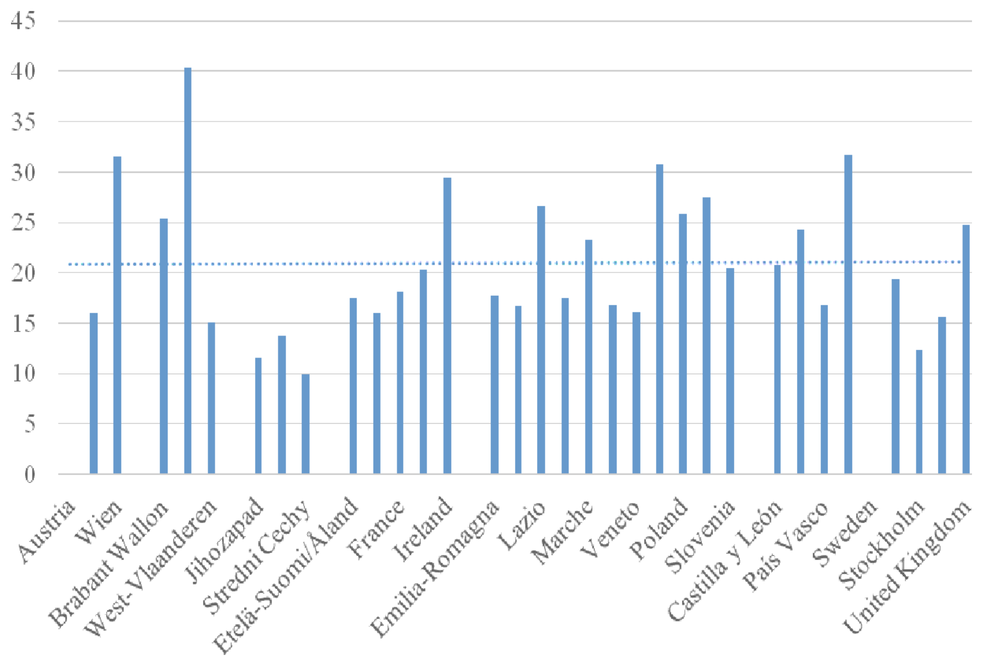

Fig.3. Share of financing of agricultural firms based on simulation results Share of self-financing of agricultural firms

Also, more effective directions of additional financing and support for agriculture have appeared and the volume of state allocations has increased, on the basis of which it can be concluded that the situation in agriculture has improved. Based on the successful experience of using the program-target method by advanced countries in the market conditions in various sectors of the economy, it was concluded that it is advisable to use it in the agricultural sector for small firms in developing countries.

Developed countries are increasing budget allocations for the development of ecosystems in the agro-complex.

New methods of rational distribution of financial support for the transition to renewable resources are very important. State economic support instruments develop agriculture. In developed countries, through the support of agriculture, the ecological approach to agricultural activities is expanding by 40%. Considering the ratio of state support to GDP, we see little improvement, which is influenced by other macroeconomic indicators and economic indicators.

The amount of financial assistance to improve the ecological balance and agricultural provision of the economy is perhaps one of the important problems of budget management in this industry.

One of the important management issues is the amount of financing for agriculture. The transition to renewable resources and the "green economy" defines the problems that are associated with growth through the consumption of agricultural products [1].

Based on the results of research and modeling, we have identified the main economic factors that determine the transition to rational use of resources in agriculture: low profitability of activities, difficult natural and climatic conditions, high electricity tariffs, low gross profit of agricultural holdings; low level of material and technical base, low wages in the agro-industrial complex. Fp is the agricultural financial support ratio

$$Fp = (M + T) * K \quad (1)$$

M - resource optimization costs, T - technology modernization, K - staffing.

Based on the results of calculating the equation, we conclude that the increase in the main basic economic factors (profitability, investment, unemployment) in the agro-industrial complex directly depends on the amount of financial support from the state.

5 Conclusion

In the article, we have identified aspects of the economic rational approach, which allows us to analyze various factors based on quantitative indicators that affect the optimization of the agro complex and the transition to environmental resources.

We evaluated the main indicators and described them with mathematical variables in a linear model. Regression determines the results of the mathematical calculations of our model.

A factorial experiment was carried out based on the constructed mathematical model and analysis based on the basic formulas. The results made it possible to include in the analytical form the relationship between input and output values. Evaluation results make it possible to take into account socio-economic factors influencing agriculture. Also, the results should be used in the resource management process to ensure the transition to a green economy. This study provides an economic model of mathematical for assessing the feasibility of ecological project in agriculture, as well as a universal and systematic procedure for using opportunities to evaluate agricultural programs for the effective operation of agricultural firms.

The economic model allows analysis based on a set of quantitative indicators. Based on the model, a complete analysis of the data was carried out, which showed the relationship between economic factors for making a rational decision.

With the help of the model presented by us, an analysis and assessment of the main economic indicators of activity in agriculture was carried out.

In our research, we, like many scientists, faced a number of problems that complicate the calculations, evaluation and prediction of the quality of our model, related to the interaction of various factors and the external environment.

One of the main advantages of our approach is that our economic model of mathematical for assessing the feasibility of a project in agriculture reflects practically applicable methods for calculating quantitative data for the main areas of agricultural.

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