

Investment in Agriculture: Methodology and Assessment



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Abstract: Food security issues have been addressed by many scientists in the framework of food policy development and government regulation of agro-industrial complex (agribusiness), where investment in agribusiness is the cost, expressed in monetary form, whose results are manifested over a long period of time or after a long period. The purpose of the article is to formulate a system of indicators for the analysis of agriculture when developing food policy. **Methods.** Application of modeling in the course of strategy development in investment activity allows taking into account the specifics of economic activity of agricultural enterprises and variability of efficiency.

Results/Conclusion

The main types of investment in agriculture are:

- capital contributions in the form of investments of financial and material and technical resources in the reproduction of fixed assets, soil fertility, and water resources through new construction, expanded technical re-equipment, and maintenance of existing production;
- investing capital in the creation of inventories;
- financial resources in the form of shares, bonds and other securities, as well as the cost of the acquisition of treasures and bank deposits, financial assets.

When developing food policy, the analysis of indicators characterizing the agricultural organization's performance allows obtaining consolidated indicator.

Combining three integrated indicators calculated for each block of indicators (Block 1 – Analysis of crop production; Block 2 – Analysis of animal production; and Block 3 – Analysis of agricultural organizations performance), into consolidated indicator allows assessing the development of agriculture in general.

Keywords: agricultural organizations performance, agro-industrial complex (agribusiness), efficiency, financial and investment factors, food policy, investments.

I. INTRODUCTION

Food security issues have been addressed by many scientists in the framework of food policy development and government regulation of agro-industrial complex (agribusiness) [1]-[8].

According to most experts, investment in agriculture when developing food policy is the cost, expressed in monetary form, whose results are manifested over a long period of time or after a long period. Therefore, any decision that is closely related to ensuring the effectiveness of investments in agribusiness, when developing food policy, depends on the following measures:

- providing long-term development of economic and investment strategy;
- choosing effective options for reducing the payback period of the investment;
- carrying out reliable forecasts characterizing the probability of changes in natural climatic conditions, competitive environment and the level of risk;
- studying the severity of the impact of various financial, investment, and other factors;
- ensuring continuous monitoring of the change in the value of money;
- identifying priority development of production areas and focusing on the elimination of failures in the food market;
- mobilizing opportunities for entry into the new food market, etc. [9].

Certainly, scientists have focused on the issues of economic security in general [10], as well as regional aspects of farming [11]-[15], while the issues of investment in agriculture and evaluation of their effectiveness remain insufficiently covered in the context of import substitution.

The purpose of the present article is to formulate a system of indicators applicable to analyze agriculture.

II. METHODS

A. General description

The main types of investment in agriculture are the following:

- capital contributions in the form of investment of financial, material, and technical resources in the reproduction of fixed assets, soil fertility, water resources through new construction,

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expanded technical re-equipment, and maintenance of existing production;

- investing capital in the creation of inventories;
- financial resources in the form of shares, bonds and other securities, as well as the cost of the acquisition of treasures and bank deposits, financial assets.

A characteristic feature of investments in agribusiness is that they must comply with the principles of expediency and usefulness of investments in various fields. Another feature is more related to the active movement of capital, providing its growth and generating additional income. If capital is not growing in its circulation and turnover, while partially transferring its value to the newly created product, then, in essence, it remains just an investment, while in terms of content it is an economic resource. In most cases, this kind of capital cannot even provide a simple reproduction, which is largely characteristic of the agricultural production sectors. An extremely important role belongs to investments that can improve the quality characteristics of not only the applied fixed capital, but also the cultivated land, the used labor resources, and the manufactured commodity products that have high competitiveness. Consequently, the essence and content of agricultural investments are clearly manifested in the evaluation characteristics of two closely interrelated and interdependent economic categories: costs and benefits [9].

B. Algorithm

Free flow of investment in the agricultural sector depends largely on medium- and long-term projections, the level of product development, and the market – especially the market of purchased inputs, both from the viewpoint of the demand behavior and from the standpoint of offers and market infrastructure development. The most radical measure to ensure the efficiency of investment in agribusiness is to maintain the technological stability of the interrelated stages:

- 1) the initial stage of the investment process – searching for profitable and reliable sources of financing, as well as fundraising;
- 2) concentration of investments in capital contributions – creating necessary capital values;
- 3) implementation of the production process – operating production facilities by more advanced methods and mechanisms;
- 4) implementation of market investments – using marketing innovation with a developed market infrastructure [16].

Investments in agriculture when developing food policy should be considered from two standpoints: as an economic category, and as a process of movement of resources in natural and monetary form. As an economic category, investments cover a system of monetary relations mediated by the movement of value. In other words, investments in agribusiness are characterized by a systematic flow of funds advanced for the acquisition and operation of fixed and current assets in order to achieve a certain effect – from the time of allocation of funds to the time of their reimbursement.

The investment activity of agribusiness when developing food policy is a necessary condition for the individual circulation of capital values. Therefore, investments in agribusiness should be carried out in more effective forms, since investments in worn-out or obsolete means of

production or technology cannot bring a positive result. The increase in the scale of investment without improved qualitative characteristics of capital values represents the result of unsuccessful management. At that, the glut of production sectors of agribusiness with old models of equipment and technology definitely constrain the production growth rate.

Note that in most cases, when determining the effectiveness of investments, not all costs are taken into account, but only capital that is a well-known capital-profit or capital-income approach. This approach lacks the value of other investment components, such as investment in working capital, i.e. increasing their volume and improving quality characteristics; investment in the human factor, which involves improving the composition of professional staff and the skills of employees; investments in land, i.e. expanding the amount of land used and improving its fertility; a lot of investment costs for the development of intellectual activity, as well as investments in social, environmental, infrastructural, market, and other areas [9].

In general, the assessment and analysis of the effectiveness of investment injections in agribusiness should be carried out in three main areas:

1. The national economic effectiveness, implying the importance of investments for the development of the country's economy in general.
2. The social effectiveness, implying the importance of investments for the development of the social sector of a particular territory.
3. Commercial effectiveness, implying the importance of the investment in terms of their profitability for any business entity of agribusiness. Commercial evaluation of investments is the final stage of pre-investment research, which is required by an investor in order to make a decision concerning participation in the project. Commercial evaluation of investments usually consists of two complementary parts: financial evaluation (financial solvency) and economic evaluation (investment efficiency) of the project. In the first case, the liquidity (solvency) of the project during its implementation is analyzed. The second case focuses on the potential ability of the project to maintain the purchasing value of the invested funds and ensure a sufficient growth rate [17].

Note that agribusiness entities, having a special specificity of investment activity and the volume of capital reserves, which are expressed in the difference of their goals and objectives, as well as the scale of investment and income generation, use a variety of criteria and methods for measuring the effectiveness of investments. At that, the main criterion to ensure the efficiency of investments for all sectors and activities of agribusiness is the creation of favorable conditions for production and market functioning, namely, obtaining maximum profit at minimum cost, as well as reducing the payback period of invested funds [17].

The basic framework of the methods used most commonly in investment analysis practice is the concept of discounting as a process of conversion of future value into modern reality, allowing taking into account the reality and rationality of investment. The use of modeling in the course of strategy development in investment activity allows taking into account the specifics of economic activity of agricultural enterprises and variability of efficiency.

Effectiveness of investments, both of individual objects, and their combination, is evaluated, as a rule, using indicators such as payback period, characterizing the starting point of coverage of investment by the total results of the project implementation, profitability (efficiency), capital productivity and capital intensity, increase in profits and production volumes, reduction of labor costs and the cost of production per one ruble of attracted investments, and others.

1) Additional output per ruble of investment (I):

$$E = (GO_1 - GO_0) / I \quad (1)$$

where E is the efficiency of investments; GO_0 and GO_1 are the gross outputs at the initial and additional investments, respectively.

2) Reduction of production costs per ruble of investments:

$$E = Q_1 * (C_1 - C_0) / B \quad (2)$$

where C_0 and C_1 are the cost-per-unit product at the initial and additional capital investments, respectively.

3) Reduction of labor costs for production per ruble of investments:

$$E = Q_1 * (TE_1 - TE_0) / I \quad (3)$$

where TE_0 and TE_1 are the labor costs per unit of production at the initial and additional investments, respectively.

4) Increase in profit per ruble of investments:

$$E = Q_1 * (P_1 - P_0) / I \quad (4)$$

where P_0 and P_1 are profits per unit of output, respectively, at the initial investments and taking into account additional investments [16].

Considering the specifics of the agricultural enterprise's activities, it should be noted that the issue of the effectiveness of investment resources will give the expected results only at a comprehensive review of each case of economic management. Moreover, the analysis procedure should be carried out both in terms of short-term and long-term effect from the perspective of the agribusiness enterprise, the entire industry, and the country, rather than just from the standpoint of commercial efficiency. Quite an attractive investment project for a particular agribusiness company, pursuing the goal of maximizing its profits, can be detrimental to another enterprise, which wants, for example, to update their production assets. Also, quite different can be the result of making the same investment decision by the agribusiness enterprises different in terms of their activity or geographical location. Thus, it is necessary to evaluate and analyze the effectiveness of investments and investment decisions in agribusiness individually in each particular case of making a decision, based on its ultimate goal.

III. RESULTS

To evaluate the development of agriculture in the course of

food policy-making, a system of indicators including three blocks was formed.

BLOCK1. Analysis of crop production.

It is advisable to start agriculture analysis with consideration of crop production because it is one of the main branches of agriculture. The main task of crop production is the cultivation of plants to produce products that meet the human need for food, animal feed, and raw materials for the processing industry. Analysis of crop production indicators provides useful information about the current situation in the industry. Indicators characterizing the crop production sector are presented in Table I.

Table I. Indicators characterizing the crop production industry

Objectives	Tasks
Examination of psychological mechanisms of unlawful activities	Identification of criminal-friendly motivation
Designing of psychological methods	Identification of personality's features, studying their influence on the person's behavior under criminogenic factors in the light of law relations
Defining the categories of "mental capacity" and "mental incompetence"	Identification of such pathological features of the character as immaturity (infantilism), suggestibility, weak social adaptation.
Analysis of age dynamics	Detection of factors of unlawful actions among minors and possibilities for their elimination
The study of the motives and possible mechanisms of crime committing	Determining features of social environment of transformations in social, political and economic fields
Rational methods of interaction	Obtaining objective indicators of any specific case, assessment of possibility resocialization of the subject
Studying the psychological structure of law enforcement officers	Identification of practical skills in vocational training and psychography in their activities
Psychological training of law enforcement officers	Formation of professional personality characteristics, psychological analysis of subjects of unlawful behavior
Provision of psychological service in law enforcement system	Providing advice and practical assistance to officials during implementation of their procedural actions
Development of psychodiagnostic methods	Conducting professional control over the activities of law enforcement officials, forming adequate motivation and preventing professional deformation
Organizational work against violence	To organize psychological education and preventive measures for offenses

Source: compiled by the authors

As follows from the analysis of indicators characterizing crop production, an integral indicator is calculated to determine the development of this industry in agriculture.

The need to calculate this indicator arises due to the fact that it provides a comprehensive view of the crop production development, while individual indicators, characterizing only some of its aspects, do not give such an opportunity.

BLOCK 2. Analysis of animal production

Animal production, along with crop production is one of the leading branches of agriculture. The importance of this sector is determined not only by its high proportion in the production of gross output, but also by its great influence on the agriculture economy, and the level of providing important food products. This explains the importance of animal production analysis in the context of agriculture analysis in general. Indicators characterizing the livestock sector are presented in Table II.

Table II. Indicators characterizing the animal production

No	Indicator	Characterization
1.	Rate of change in animal production	This indicator is similar to the growth rate of animal products and is calculated as the ratio of animal products in monetary terms in the reporting year to that in the base year.
2.	The rate of change in the sale of animal products in real terms	This indicator characterizes the growth or decrease in the volume of animal products sold in real terms and is calculated by the ratio of the volume of sold products in the reporting year to that in the base year.
3.	Rate of change in livestock and poultry population	The indicator characterizes the dynamic pattern in livestock and poultry population in the reporting period compared to the baseline.
4.	Indicators of animal productivity	Animal productivity is determined by the number of products produced from one head for the corresponding period of time. Milk yield per cow is an indicator of adult cattle productivity. Indicators of poultry productivity are defined by the output of eggs per one hen; while in sheep raising – by sheared wool per one head, etc.

Source: compiled by the authors

As a result of the analysis of indicators characterizing animal production, an integral indicator is also calculated, which allows determining the development of this industry in agriculture.

BLOCK 3. Analysis of agricultural organizations performance

This unit reflects the main indicators of characterizing agriculture in general. This is, for example, the volume of agricultural production, which is one of the main indicators characterizing the activities of both agricultural enterprises and the region in general. Its value determines the volume of sales, and hence the degree of satisfaction of the population's needs in food, while of the processing industry – in raw materials. These are also capital productivity, depreciation of fixed assets, their renewal, i.e. indicators that affect the efficiency of agricultural development. These are also GRP,

labor productivity, the profitability of agricultural product sales, that is, indicators that express the efficiency of agricultural development and its effectiveness (Table III).

Table III. Indicators characterizing the performance of agricultural organizations

No	Indicator	Characterization
1.	Rate of change in agricultural GRP	This indicator is found as the ratio of the gross regional product of agriculture of the reporting period to that of the base period.
2.	Rate of change in agricultural production	This indicator characterizes the level of growth or decline in agricultural production (including crop and animal production) in the reporting year compared to the base year and is determined by the ratio of agricultural production in monetary terms in the reporting year to that in the base year.
3.	Rate of change in agriculturally used areas	Agriculturally used areas are called the land intended for growing crops, raising livestock, and performing other related works. The agriculturally used areas include the following groups of plots: arable land, pastures, hayfields, perennial plantations, and laylands. The rate of change in agriculturally used areas shows the dynamic pattern of the area of agricultural land and is defined as the area of farmland in the reporting year related to that in the base year.
4.	Capital productivity ratio	This indicator is used to determine the efficiency of the entire mass of fixed assets. It is defined as the ratio of the agricultural products value to the value of fixed assets.
5.	Coefficient of renewal of basic production assets	This indicator is defined as the ratio of the cost of fixed assets introduced during the year to their value at the end of the year. Coefficient of renewal of basic production assets means an increase in the total fleet of machines and equipment at the expense of new, usually more efficient machines that creates conditions for increasing the production of new products, improving its quality, and competitiveness.
6.	Depreciation of fixed assets	This indicator is determined by the ratio of the amount of accrued depreciation to the original cost of fixed assets and shows how worn out fixed assets are, i.e. to what extent their possible future replacement is financed in the course of depreciation.
7.	Rate of change in investments into fixed assets	Contribution in fixed assets is a real investment in fixed assets, including the cost of new construction, expansion, purchase of machinery, equipment, etc. The indicator is defined by the ratio of the fixed assets introduced in the reporting year to that introduced in the base year.
8.	Labor efficiency	Labor efficiency is productivity in the agricultural sector, which is expressed by the quantity or value of the output produced per unit of time. The indicator is defined as the ratio of the agricultural products value to the number of agricultural workers.
9.	The profitability of agricultural production sales	The indicator is defined as the ratio of profit from sales of agricultural enterprises to gross regional product.

Source: compiled by the authors



The analysis of indicators characterizing the activities of agricultural organizations results in an integral indicator. Combining the three proposed integrated indicators calculated for each block of indicators into one integrated indicator allows assessing the development of agriculture in general.

IV. CONCLUSION

The main types of investment in agribusiness are:

- capital contributions in the form of investments of financial, material, and technical resources in the reproduction of fixed assets, soil fertility, and water resources through new construction, expanded technical re-equipment, and maintenance of existing production;
- investing capital in the creation of inventories;
- financial resources in the form of shares, bonds and other securities, as well as the cost of the acquisition of treasures and bank deposits, financial assets.

The analysis of indicators in the course of food policy-making, which characterize the agricultural organizations' performance, results in an integral indicator.

Combining three integrated indicators calculated for each block of indicators (Block 1 – Analysis of crop production; Block 2 – Analysis of animal production; Block 3 – Analysis of agricultural organizations performance) into one consolidated indicator allows assessing the development of agriculture in general.

Using all the indicators described, further research should be directed towards food policy-making. The authors will conduct a comprehensive description of agriculture evidence from a particular region of the country in order to identify existing problems.

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