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Assessment and Forecasting of the Effectiveness of the Agricultural Company's Innovation and Foreign Economic Activity Strategy

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Abstract

The current conditions for the functioning of enterprises that are participants in foreign economic activity are the result of active de-monopolization and liberalization in the sphere of the country's trade relations in the international arena and require independent solutions to a wide range of problems, among which the issue of strategic management of their activities occupies a vital place. Based on the analysis of the theoretical basis for studying the subject of research, the authors proposed appropriate measures to assess and predict the effectiveness of the strategy of innovative and foreign economic activity of an agricultural enterprise. The authors proposed a procedure for a comprehensive assessment of the enterprise's innovation activity strategy, which is based on forecasting the economic sustainability indicator of the enterprise and consists of 7 stages, which are described in detail. The authors tested the proposed procedure at an agricultural enterprise, which proved its effectiveness. The practical significance of the study is revealed through the possibility of using the proposed measures to manage an agri-enterprise's innovative and foreign economic activity to improve it.

Keywords: Agricultural company; Innovations; Foreign economic activity; Management strategy evaluation; Strategy; Strategic enterprise management.

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1. Introduction

Innovative and foreign economic activities are one of the pillars of the company's well-being, because they can ensure the release of additional financial resources, the company's entry into foreign markets and competitiveness. The complexity of this area for agricultural companies also lies in the fact that it is not enough to use the methods of investment analysis for it, and the specifics of the activity make their adjustments. Since innovative projects are more long-term, expensive and risky compared to investment ones, the evaluation of their effectiveness includes the choice of optimal financing schemes, as well as an assessment of the technological and strategic significance of the innovative activity of the enterprise as a whole. The development of foreign economic activity gives the enterprise new opportunities: the use of the advantages of international production cooperation, the freedom to make decisions for the implementation of their production tasks (free choice of production resources, freedom to choose directions and forms of sales of manufactured products, a production partner in cooperation, etc.) [1].

Strategic Enterprise Management is the management of the process of creating and implementing a strategy. Strategic planning, which is associated with the definition of the organization's activity strategy (integrated development plan), is part of Strategic Management at the enterprise.

Among the stages of strategic planning at the enterprise, considerable importance is paid to the choice of strategy and its evaluation for compliance with the established criteria (mission, goals of the organization, ...) [2]. This ensures that the company's strategy is chosen correctly. The evaluation also takes place in the process of implementing the strategy; its purpose is to identify the need to adjust the strategy, evaluate the results obtained, and

so on. Each aspect of strategy evaluation is related to solving a problem situation and has its characteristics, which determine the use of the appropriate methodological apparatus.

In their previous works, the authors have already studied various aspects of the effectiveness of the strategy of innovative and foreign economic activity [1, 3, 4], however, the specifics of the activity of agro-industrial enterprises make their own corrections, thus the purpose of the study is to find ways to improve the management of the effectiveness of the strategy of innovative and foreign economic activity of an agro-firm.

2. Literature Review

In managing enterprises of various economic activities, strategy assessment at the stages of strategic planning occurs when choosing the optimal strategy. For this purpose, a procedure for evaluating management strategies has been developed (Management strategy evaluation (MSE)), which includes predicting the performance criteria values for each strategy and modelling. In the work of A. M. Smith matrix methods are also recommended for evaluating the strategy [5].

According to the views of Tynchenko, *et al.* [6], the assessment of the chosen strategy is based on the analysis of the enterprise's external environment and internal capabilities (SWOT analysis). In addition, the chosen competitive strategy should be evaluated for compliance with corporate goals [6]. Orekhova [7], also used SWOT analysis to assess the level of development of the financial strategy. Based on this, we note that SWOT analysis is the most commonly used method for analyzing external and internal environmental factors used in strategic planning. Based on its results, the strategy is evaluated.

Ayşenur and Hikmet [8], suggest using the hierarchy analysis method (AHP method) when choosing the optimal strategy in enterprises. According to the order in which the method is used, a wide range of criteria and sub-criteria are used to evaluate the strategy, such as strategic compatibility, potential, financing, risks, considerations, opportunity costs, and so on. It is appropriate to use the hierarchy analysis method when evaluating an enterprise's strategy, but it should be supplemented with an analysis of external factors influencing the enterprise and its strategy (and not just taking into account business risks) [9, 10].

Let us consider the second direction – evaluation in the process of implementing the strategy in order to identify the need for adjustment. In work of Haixu, *et al.* [11], a system of indicators has been developed that assesses the ability of an enterprise's strategy to adapt:

1. The ability to perceive information (efficiency of information content, the complexity of information content, timely receipt of information, etc.);
2. The ability to assess the situation (accuracy of situation assessment, depth of situation assessment, scientific nature of judgments);
3. The ability to make strategic decisions (correct direction of regulation, clear settings, prompt adjustment strategy, prevention of strategic risks);
4. Organizational adaptability (adaptability of the organizational structure, depth of understanding of employees, level of employee learning abilities).

To assess the ability of an enterprise's strategy to adapt, you should use the point-factor method and expert assessment, which is known to be characterized by subjectivity.

The authors do not specify the methodology for calculating indicators. Still, they indicate the stages of evaluation: selecting experts, determining the base and level of evaluation, calculating individual indicators, and comprehensive assessment.

In work of Minyi [12], a recommended strategy adjustment coefficient (factor) is tested on the company's market penetration strategy. It depends on the scale of production of the enterprise and its production capacity and contains a production function. The author also presents a scheme for adjusting the company's strategy, which provides for strategic analysis, analysis of the company's business viability, analysis of the current situation in the field of informatization, and industry analysis. The author's approach is specialized and can be used in the case of using the company's market penetration strategy (also positioning strategies). For other competitive strategies of the enterprise, the approach should be adapted, which will lead to a change in the methodology for calculating the strategy adjustment coefficient.

To determine the need for adjustment of the financial strategy of the enterprise, Melnyk and Kushchova [13] propose to study changes in external and internal factors affecting the enterprise (return on sales, return on assets, administrative expenses, equity, current assets, gross profit, other operating expenses, operating income, accounts payable, the volume of commodity production, number of employees, depreciation of fixed assets, average monthly salary of an employee, accounts receivable, ...). For this purpose, it is proposed to use methods of economic and mathematical modelling (multivariate regression models). Among the independent variables of the model, only financial and economic indicators of the enterprise's activity, which are quantifiable, are used. The model should be supplemented with indicators that characterize changes in the external environment of the enterprise.

In work of Popkova, *et al.* [14], the main directions of evaluating the effectiveness of the company's strategy are summarized: the effectiveness of the implementation of individual strategic projects (provides for the assessment of the company's projects by the time of performance, cost and additional effects that arose during its implementation), the degree of achievement of strategic goals (the level of achievement of the results of production and economic activities is assessed), the degree of compliance of strategic goals with the interests of interested parties (the effectiveness of the strategy depends not only on the achievement of the company's goals but also on the degree of consideration of the interests of interested parties). The latter direction is complex and time-consuming because the

interested parties of the enterprise may have different and sometimes opposite interests. Thus, their absolute achievement in implementing the company's business strategy is impossible.

Gerashchenkova [15], emphasizes the need for constant monitoring of the state of implementation of the company's strategy, for which it is necessary to assess the current value of economic indicators and their growth rates, which can be carried out in a standard order. The essence of indicators for evaluating the effectiveness of a strategy in the formed sequences is established based on the need to ensure innovative development of the enterprise. At the same time, the degree of compliance with the structure of actual indicators formed by the base value indicates the effectiveness of management, which is quantitatively characterized by the narrowness of rank correlation. By setting a priority sequence of indices, you can develop and establish a model of successful economic activity in the enterprise's programs and plans of strategic development. At the same time, the authors did not disclose the content of economic indicators intended to evaluate the strategy's effectiveness.

To determine the results of the implementation of the strategic plan of the enterprise [16] provides for the implementation of successive stages: the formation of a list of indicators (i = 1, …, n intended for evaluation; determining the level of significance of each indicator (ki); calculating the average rate of change in indicators for several periods preceding the stage of implementation of the strategy (T), and the rate of their growth during the implementation of the strategic plan (Tstr); analyzing the dynamics of changes in indicators; determining the degree of implementation of the strategy as a percentage according to the appropriate formula. As for specific indicators intended for evaluating the company's strategy, they are not specified in the article. In contrast, Mostenska and Karnaukh [17] provide indicators that should be used in analyzing the effectiveness of the enterprise's import strategy:

- import costs in the implementation of the strategy;
- Net income (revenue) from sales of imported products;
- Economic efficiency based on the leading indicators of the company's foreign economic activity;
- Efficiency of the leading indicators of profitability of the enterprise;
- Financial results of operations;
- The degree of risk in implementing import activities [17].

A unified organizational approach to evaluating the results of implementing financial and economic development strategies at the enterprise is recommended by Nevdachyna [18]. It is formed based on a study of indicators for evaluating various types of enterprise strategies. Having studied them in detail, we can distinguish the following leading indicators: the index of profitability (efficiency); the rate of operating profit; turnover of current assets; the coefficient of financial independence; the coefficient of manoeuvrability of equity; the coefficient of providing own working capital; the return on assets of the enterprise; the coefficient of asset turnover; the coefficient of current liquidity. It is appropriate to use these indicators when evaluating the company's strategies in the financial and economic sphere.

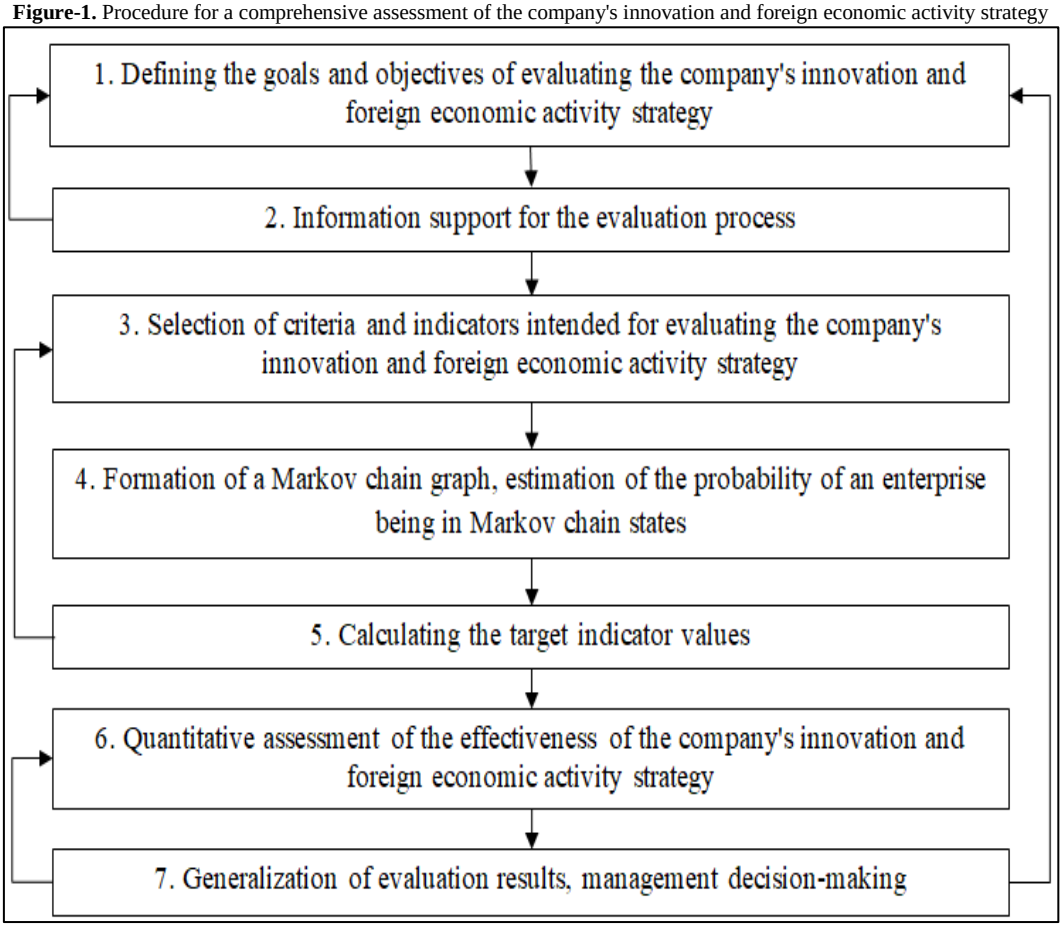
It is proposed to evaluate the effectiveness of strategic management of an industrial enterprise using a single criterion (the criterion of stability of the enterprise's functioning relative to the goal set) [19]. The method of calculating the stability indicator close to the set goal without taking into account the influence of the external environment provides for the following stages: building a mathematical model based on goal setting and determining the goal area based on the constructed model; determining critical parameters of strategic enterprise management that have a random nature, identifying the types of their distribution and specific values; calculating the quantitative stability indicator.

3. Results

Schmidt [20], recommended to assess and predict the economic stability of an enterprise, for which the Markov chain graph is used. In particular, to determine the projected value of the company's cash flow (economic stability target indicator), the authors used the probabilities of the company's stay in Markov chain states. Thus, the quantitative indicator of the economic strength of the enterprise is formed based on cash flow forecasts.

Using Schmidt’s approach to predicting the indicator of economic stability of an enterprise, we recommend the procedure for evaluating the company's innovation and foreign economic activity strategy (Figure 1).

Figure-1. Procedure for a comprehensive assessment of the company's innovation and foreign economic activity strategy



Source: developed by the authors

1. Defining the goals and objectives of evaluating the company's innovation and foreign economic activity strategy. The purpose of the assessment is to identify the strategy's compliance at different planning stages and the main results of its implementation. According to the evaluation directions and the considered methodological approaches to their provision, the possibility of their integration is revealed. For this purpose, an integrated approach to the evaluation should be recommended, ensuring continuity of its implementation. Thus, using a single methodological approach will increase the reliability of the obtained results and their applied nature.

2. Information support of the evaluation process consists in collecting information about the company's innovation and foreign economic activity strategy, stages of strategic planning, it's verification, processing, and so on.

3. Selection criteria and indicators intended to evaluate the company's innovation and foreign economic activity strategy. Taking into account the need for an objective assessment of the effectiveness of the strategy at all stages of its planning, employees' salary costs should be chosen as an indicator [4, 21]. This quantitative indicator is objective since at the initial stages of strategic planning, the enterprise may not receive net income (the value of the net income indicator is uneven at the stages of strategic planning of the enterprise) and invest significant funds in scientific developments (the total cost depends on the strategic planning stage). Over time, the employee salary cost indicator (SC) can be replaced by the company's cash flow, total net income, or total cost of the company.

4. Formation of a Markov chain graph estimates the probability of an enterprise being in Markov chain states. The graph of the Markov chain indicates the transient possibilities of states of strategic planning processes of innovation activity of the enterprise.

5. Calculation of projected target values. The projected values of the company's salary costs (SC) are defined as follows:

$$PC_j(i) = \pi_{i,j} \times Q_{i,j}, \qquad \text{(Equation 1)}$$

where $\pi_{i,j}$ – transition probabilities of states of the Markov chain graph of strategic planning of innovative activity of an enterprise at the i-th stage of strategic planning in the j-ve state (S1-S6);

$Q_{i,j}$ – the value of the indicator of labour costs of the enterprise, which is chosen as an indicator for evaluating the strategy of innovation activity of the enterprise at the i-th stage of strategic planning in the j-ve state (S1-S6).

For calculating the indicator for evaluating the company's innovation and foreign economic activity strategy, let us use the formula:

$$(i) + CP_2(i) + \cdots + CP_m(i) = CP_{<m>}(i) \qquad \text{(Equation 2)}$$

where $CP_1(i), .. CPm(i)$ – average values of employee salary costs at the i-th stage of strategic planning in the j-ve state (S1-S6) of the Markov chain graph.

Based on equations 1, 2, the expected values of employee salary costs ($CP_{<m>}$) for the stages of strategic planning are calculated as follows:

$$CP_{<m>}(i)=\begin{Vmatrix} \pi_{1,1}\times CP_{1,1} & \pi_{1,2}\times CP_{1,2} & 0 & \pi_{1,4}\times CP_{1,4} & 0 & 0 & \pi_{1,7}\times CP_{1,7} \\ 0 & \pi_{2,2}\times CP_{2,2} & \pi_{2,3}\times CP_{2,3} & 0 & 0 & 0 & \pi_{2,7}\times CP_{2,7} \\ 0 & 0 & \pi_{3,3}\times CP_{3,3} & \pi_{3,4}\times CP_{3,4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \pi_{4,4}\times CP_{4,4} & \pi_{4,5}\times CP_{4,5} & 0 & \pi_{4,7}\times CP_{4,7} \\ 0 & 0 & 0 & 0 & \pi_{5,5}\times CP_{5,5} & \pi_{5,6}\times CP_{5,6} & 0 \\ 0 & 0 & 0 & 0 & \pi_{6,5}\times CP_{6,5} & \pi_{6,6}\times CF_{6,6} & \pi_{6,7}\times CP_{6,7} \\ 0 & 0 & 0 & 0 & 0 & 0 & \pi_{7,7}\times CP_{7,7} \end{Vmatrix}$$

(Equation 3)

6. Quantitative assessment of the effectiveness of the company's innovation and foreign economic activity strategy was carried out based on expected values of employees ' salary costs at the enterprise's strategic planning stages. To do this, let us calculate the mathematical expectation ($M(CP_{(i)})$) of the expected salary costs of employees of the enterprise in each of the stages of strategic planning (states S1-S6). Calculations can be made using the formula:

$$M(CP_{(i)})=\sum_{j=1}^{6}(\overline{\pi_{i,J}}\times Q_{i,j}) \quad \text{(Equation 4)}$$

7. Generalize evaluation results (statistical analysis of forecasting results, calculation of standard deviation, variance, ….), and make managerial decisions.

4. Approbation

Let us use the developed procedure for a comprehensive assessment of the innovation and foreign economic activity strategy of Limited Liability Agricultural Company «LVIV-AGRO» – is a Ukrainian agro-industrial company, that operates an extensive land bank in Western Ukraine. Cultivates lands are in Ukraine (Ternopil, Ivano-Frankivsk, and Lviv regions). Control over the company's assets belongs exclusively to Ukrainian investors. The company is certified by the international quality and safety standards ISO 9001, ISO 22000:2005. It stands to reason that today this quality management system is the most authoritative in the world; it is a series of international standards, each of which is dedicated to different aspects of food safety management. This allows the company to compete in price and quality with products from other manufacturers. The company operates a technological food laboratory accredited by Ukragro standards, which carries out systematic quality control of the entire product range. The input data of the assessment are summarized in Table 1.

Table-1. Input data for a comprehensive assessment of the «LVIV-AGRO» LLC innovation strategy

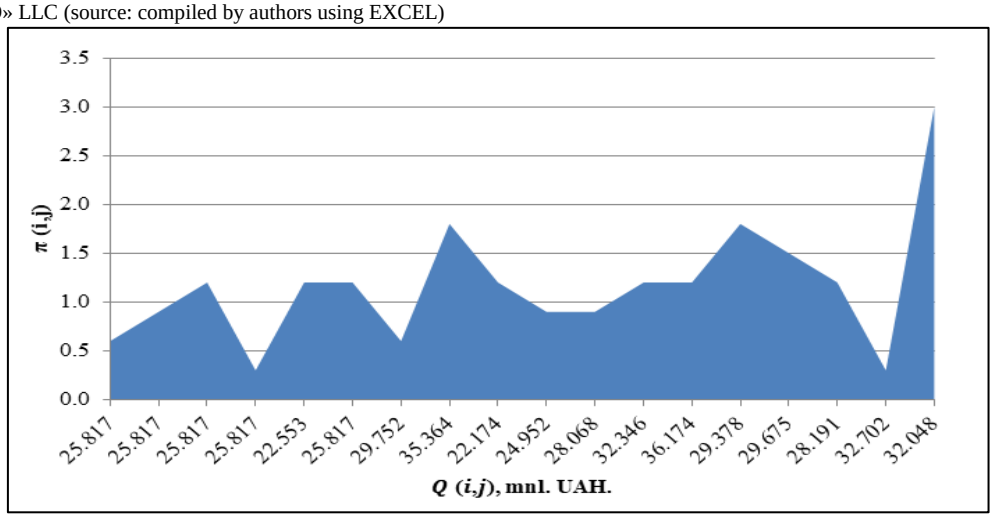
Indicators	State of processes in the Markov model graph																	
	S_1				S_2			S_3		S_4			S_5		S_6			S_7
	$\pi_{1,1}$	$\pi_{1,2}$	$\pi_{1,4}$	$\pi_{1,7}$	$\pi_{2,1}$	$\pi_{2,2}$	$\pi_{2,7}$	$\pi_{3,3}$	$\pi_{3,4}$	$\pi_{4.3}$	$\pi_{4.4}$	$\pi_{4,7}$	$\pi_{5,5}$	$\pi_{5,6}$	$\pi_{6,5}$	$\pi_{6,6}$	$\pi_{6,7}$	$\pi_{7,7}$
$\overline{\pi_{i,J}}$	0,6	0,9	1,2	0,3	1,2	1,2	0,6	1,8	1,2	0,9	0,9	1,2	1,2	1,8	1,5	1,2	0,3	3,0
$Q_{i,j}$, million. UAH.	25,817	25,817	25,817	25,817	22,553	25,817	29,752	35,364	22,174	24,952	28,068	32,346	36,174	29,378	29,675	28,191	32,702	32,048

5. Discussion

Using the financial statements and management report of «LVIV-AGRO» LLC, authors analysed values of $Q_{i,j}$, $(i = 1,2,\ldots,m)$ in each of the states of the enterprise's strategic planning process and in the corresponding period and the corresponding transition probabilities of being in these states ($\overline{\pi_{i,J}}$). The results can be displayed as a distribution series and a distribution Polygon. Several distributions of enterprise cost values for Labour remuneration and transition probabilities of strategic planning States of «LVIV-AGRO» LLC are shown in Figure 3.

According to Table 1, let us calculate the values of the indicator for evaluating the innovation strategy (employee salary costs) of «LVIV-AGRO» LLC and the mathematical expectation in each of the stages of strategic planning (states S_1-S_6).

Figure-2. A series of distributions of enterprise cost values for labour remuneration and transition probabilities of strategic planning states «LVIV-AGRO» LLC (source: compiled by authors using EXCEL)



The calculation results are summarized in Table 2.

Table-2. Calculation of the values of the indicator for evaluating the innovation and foreign economic activity strategy and mathematical expectation in each of the stages of the «LVIV-AGRO» LLC strategic planning (source: compiled by authors using EXCEL)

Indicators	State of processes in the Markov model graph																	
	S_1				S_2			S_3		S_4			S_5		S_6			S_7
	$\pi_{1,1}$	$\pi_{1,2}$	$\pi_{1,4}$	$\pi_{1,7}$	$\pi_{2,1}$	$\pi_{2,2}$	$\pi_{2,7}$	$\pi_{3,3}$	$\pi_{3,4}$	$\pi_{4,3}$	$\pi_{4,4}$	$\pi_{4,7}$	$\pi_{5,5}$	$\pi_{5,6}$	$\pi_{6,5}$	$\pi_{6,6}$	$\pi_{6,7}$	$\pi_{7,7}$
$CP_{i,j}$	0,466	0,699	0,933	0,233	0,815	0,933	0,537	1,916	0,802	0,676	0,760	1,168	1,307	1,592	1,341	1,019	0,295	2,894
$M(CP_{(i)})$	2,332				2,285			2,718		2,604			2,899		2,655			2,894

The obtained data are statistically processed, the standard deviation of the obtained results is: σ_1 =2,420; σ_2 =2,382; σ_3 =2,184; σ_4 =2,758; σ_5 =2,289; σ_6 =2,532.

As a result, we claim that the company's innovation and foreign economic activity strategy has the most remarkable effectiveness in the state of the S_5 stages of strategic planning. These findings are confirmed [20, 22]. At this stage, the company's strategy and strategic plans are distributed among the company's employees through line managers. Therefore, this is due to the involvement of more enterprise employees in the strategic planning process, who, in their activities, can achieve positive results in implementing the strategy, which is confirmed in the study of Malynovska, *et al.* [4]. In the activities of «LVIV-AGRO» LLC, much attention is paid to employee incentives, so at this stage, the value of the indicator that is designed to assess the innovation strategy of «LVIV-AGRO» LLC (employee salary costs) may increase.

6. Conclusion

The study showed that the strategy of innovative and foreign economic activity of the enterprise has the greatest effectiveness in the state of involving employees (dissemination of the enterprise strategy and strategic plans among the employees of the enterprise through the line managers of the strategic planning stages).

Evaluating and forecasting the effectiveness of the strategy of innovation and foreign economic activity of an agricultural company to determine the level of effectiveness of the introduced innovations requires the application of a comprehensive approach to efficiency and at the enterprise according to a clearly formed system of indicators, which to the greatest extent will correspond to the specifics of the economic activity of the agricultural enterprise and inform various interested parties, involved in innovative processes and foreign economic activity at the enterprise, about the quality of the obtained innovative results. Further development of this problem is aimed at applying the economic and mathematical apparatus for forecasting the future innovative growth of an agricultural enterprise.

Conflict of Interest

The authors declared that present study was performed in absence of any conflict of interest.

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