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METHODICAL APPROACH TO ASSESSMENT OF THE LEVEL OF INNOVATION ACTIVITY OF AGRARIAN COMPANIES

Determination of issue. Innovative technology is an essential part of ensuring efficient operational and financial activities of agriculture in the new market conditions. Innovating on farms leads to positive changes, such as: increase productivity, save different types of resources, reduce costs, reduce production costs and so on. However, agricultural production in Ukraine in performance and efficiency of innovation is far behind the EU Member States. Since it is innovation at the present stage of economic development is the main source of competitive advantage, research on improving the innovation activity of agricultural enterprises and its evaluation are particularly relevant.

Analysis of recent researches and publications. Analysis of recent research and publications. Theoretical and practical aspects of innovative activity of agricultural enterprises more fully covered in the scientific research of famous Ukrainian and foreign scientists as A. Datsii [8], M. Zubets [4], D.Krysanov [1], O. Kot [2], R. Minnikhanov [10], V. Pokotylova [3], P. Sabliuk [4], O. Skydan [5], A. Shubravska [1], Iu. Shumpeter [9]. However, despite the presence of a large number of scientific papers on the problems of innovative development, it should be noted a lack of coverage for assessing the level of innovation activity of companies, including agricultural, which determines the relevance and necessity of this study.

The issue. The aim of the study is to research and theoretically justify the concept of innovative agricultural companies and the development of methodological approach to assess its level of innovation considering the technological, economic, social and environmental factors.

Provision of main material of research. Traditionally [2, 3] innovationally active is a company, conducting innovative activity, thereby focusing on the evidence of its innovation. In the vast majority of farms partial upgrade, some minor modifications or improvement of agricultural technologies are considered as innovation. However, such a transformation does not usually lead to qualitative changes in the production of business entities, and therefore do not contribute to economic performance, as most of the innovations are based on the borrowing experience leading domestic and foreign farms without local peculiarities of agricultural production. Even though the quantitative analysis of innovation activity parameters farms there are many controversial issues. Judging by the number of created or implemented agriculturally innovative company, these parameters are usually not indicative: in agricultural practices common situation when the quantitative parameters are significant, but their impact on economic and social efficiency of enterprises is insignificant. There's also the opposite situation, when agricultural company introduces only a single element of innovation, which leads to a significant increase economic efficiency of all production activities based on environmental and social requirements.

The novelty and specificity of new technological changes create the need for the concept of "innovation active agricultural company", which more fully reflects the essence of quality changes based on the use of advanced high-tech knowledge to entities in the agricultural sector. Under the innovative active agricultural company shall mean a new type of agricultural enterprise, which has focused strategic activities with the introduction of elements of innovation activities that are complex, the needs of the market and yield high levels of economic and social efficiency, which together provide the company a strong position in the external environment. In this interpretation the emphasis is on the fact that innovation activities should always show signs of progressiveness (meet market requirements and to some extent this form requirements) that will enable the agricultural enterprises in the economic competition with competitors in the international environment. At the same time, it is updated questions specificity determining changes in agricultural production, which would certify its transition to innovation- active development model.

All of the above led to the development of the methodological approach to assess the level of innovation activity of agricultural enterprises through a combination of the reference method and the method of integrated assessments that allow one to estimate the degree of involvement in the production process and advanced technology to determine the socio- economic impact of their use in production.

To this end, a sociological survey of more than 100 farms in Zhytomyr region. As a result, identified 32 companies that have implemented some elements of innovation. Of these , for further analysis selected 14 companies (ALLC "MyRoslavel –Agro", PC "Troyanivske", JPC "Lad", PC "Myrolyubivske", ALLC "Plemzavod Korostyshiv", ALLC "Ptakhivnyk", PAC "Zolota Nyva", LLC "Agrosoyuz", PAC "Kamianka", PC "Chaykivka", GC "Rohachivske", PC "Moia Nadiia", AC "Druzhva", LLC "Ukr-Agro RT"), which indicated that positive results from innovation. Such companies have been the basis for determining the benchmark of innovative agricultural companies.

In the development of systematic approaches to assess the level of innovation activity of enterprises developed and the system of indicators on the basis of performance innovations in agriculture, as technological, economic, social and environmental (Table 1).

In order to unite dissimilar performance and provide information unidirectionality when comparing and combining them into an integrated assessment destimulators (costs 1 USD of gross output and complexity of economic activity) to convert to stimulants (formula $X_{st} = 1/x_{dst}$).

Table 1

Complex of parameters for evaluation of level of innovational activity of agrarian company

Parameters	Indexes characterizing a parameter	Characteristics of a desired condition of index	Weight of index
Technological	- gross output (for primary cost) per 1 ha of agricultural lands	max	0,15
	- gross output (for primary cost) per 1 employee, UAH	max	0,14
	- expenses for 1 UAH of gross output, UAH	min	0,17
	- labor cost of commercial activity	min	0,12
Economic	- income for 1 ha, UAH	max	0,11
	- profit for 1 employee, UAH	max	0,09
	- profitability level, %	max	0,08
Social	- average monthly salary, UAH	max	0,06
	- unit weight of social expenses in expenses structure, %	max	0,05
Ecological	- collaboration of organic fertilizers to mineral ones	From 1:0 to 1:5	0,02
	- unit weight of intensive plants in total seeding square, %	Not more than 30 %	0,03

Source: generated by the author.

To ensure the comparability of the ratio of mineral to organic fertilizers and intensive crop proportion of the total acreage used a single measurement point system, with 5 points - the most preferred and 1 point - the worst result. Each individual is given the corresponding value of the index score (Table 2).

Table 2

Estimation by Score-Scale of Indexes "Correlation of Organic Fertilizers to Mineral Ones" and "Unit Weight of Intense Plants in Total Seeding Square"

Unit Weight of Intensive Plants in Total Seeding Square		Correlation of Organic Fertilizers to Mineral Ones	
Value	Score	Value	Score
0-10	5	1-0,40	5
11-20	4	0,41-0,20	4
21-30	3	0,21-0,10	3
31-40	2	0,11-0,06	2
more than 41	1	more than 0,06	1

Source: generated by the author.

Scientists believe that the ratio of organic farming and organic fertilizers, t / kg of active ingredient must be from 1:0 to 1:5, i.e. 1-0,2. In agriculture chemicals it is 1:8-1:15, or 0,125-0,067 [7]. As for intensive crops, which include sugar beets, flax, potatoes, vegetables, sunflower, grain maize, hemp, their optimal share of total farm acreage shall not exceed 30%.

Based on the proposed system of indicators generated matrix data and the reference set of innovative agricultural company, that company that has the best (maximum) results among 14 companies of all comparable parameters (Table 3).

Table 3

Matrix of Output Data for Evaluation of Level of Innovation Activity of Agrarian Companies*

#	Index										
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
1	6115	180917	1,11	11,1	132,8	3929,2	3,7	1017	2,5	4	5
2	4778	68688	1,19	3,2	754	10850	27,1	1378	8,1	5	5
3	5446	282023	1,28	25	1109	57342	20,3	844,8	1,2	4	1
4	3940	139990	1,56	6,7	1097	38974	31,1	1346	4	4	1
5	2361	112600	1,18	12,5	148,5	4550	7,6	554,2	2,2	5	5
6	8065	208654	1,43	10	1424	43136	22,2	1703	2,7	3	1
7	4062	87480	1,33	6,7	429	10060	15,4	761	4	4	5

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
8	4773	28885	1,56	7,7	2834	172901	51	2411	3,5	1	1
9	13943	168420	1,05	7,1	3002	36272	17,5	1545,5	3,6	3	1
10	4232	180346	1,3	9,1	661	28153	22	1220	3	2	2
11	4608	114391	1,39	5,3	1058	26261	30	1389	4,9	4	1
12	4372	282758	1,45	20	1579	102124	64	938	1,5	2	1
13	4212	135562	2,7	10	893	28733	33	1081	2,7	2	1
14	5617	988180	1,23	12,5	279	49065	4	1270	2,6	2	1
E	13943	988180	2,7	25	3002	172901	64	2411	8,1	5	5

* x_1 - Gross output per 1 ha of agricultural land, UAH, x_2 - production of gross output per 1 employee, UAH, x_3 - expenses per 1 UAH of gross output, UAH, x_4 - working capability of commercial activity, x_5 - income per 1 ha, UAH, x_6 - income per 1 employee, UAH, x_7 - profitability, %, x_8 - average monthly salary, UAH, x_9 - unit weight of income directed to social measures, %, x_{10} - share of expenses on mineral fertilizers in costs structures, % , x_{11} - share of intensive plants in structure of seeding, %; E – standard company.

Source: data of statistics reports (forms # 50 of agriculure).

In further calculations, performance of each company compared to the benchmark, i.e. the base of calculation is the highest results from the totality of actual performance. Standardization (normalization) performance of the benchmark was carried out as follows:

$$a_{ij} = \frac{x_{ij}}{max\, x_{ij}}, \tag{1}$$

where X_{ij} – value of i-index in j-company;

$max\, x_{ij}$ – maximum value of i-index in standard company.

As the importance of the proposed indicators from the standpoint of the impact on the efficiency of agricultural production are not the same, the calculations performed to determine the weighting factors. In regard to the weight of individual indicators typically used Fishburn. The peculiarity of this method is that the process of calculating the weight parameters requires no more information than necessary ranking all factors in decreasing order of their influence: $X_1 \geq X_2 \geq \cdots X_n$.

In terms of the efficiency of agricultural production, innovation indicators are placed in sequence. Unlike other industries, agriculture, land is a major factor in investing investment and innovation resources for profit. Parameters that characterize the efficiency of invested funds and adaptability of production is primarily - plant yield and productivity of animals derived from them - profit, profitability, etc.. Calculation of parameters of technological efficiency is primarily because they determine the economic, social and environmental performance. Thus, the method Fishburn, the weight of i (a_i) factor can be determined using the formula 2 [6]:

$$a_i = \frac{2(N-i+1)}{(N+1)N}, \tag{2}$$

where N – total amount of indexes;
i – index number of value.

Based on the data, evaluation of innovative activity of each agricultural company is calculated for each group of parameters by the formulas:

$$I_{\text{тех.}} = \sum_{i=1}^{n} a_i x_{ij} = 0{,}15x_1 + 0{,}14x_2 + 0{,}17x_3 + 0{,}12x_4 \tag{3}$$

$$I_{\text{екон.}} = \sum_{i=1}^{n} a_i x_{ij} = 0{,}11x_1 + 0{,}09x_2 + 0{,}08x_3 \tag{4}$$

$$I_{\text{соц.}} = \sum_{i=1}^{n} a_i x_{ij} = 0{,}06x_1 + 0{,}05x_2 \tag{5}$$

$$I_{\text{екол.}} = \sum_{i=1}^{n} a_i x_{ij} = 0,02x_1 + 0,03x_2 , \qquad (6)$$

where, $I_{\text{тех.}}$, $I_{\text{екон.}}$, $I_{\text{соц.}}$, $I_{\text{екол.}}$ – levels of innovation activity under the technological , economic, social and ecological parameters evaluation;

a_i – The value of the weight of each indicator of technological, economic, social and environmental parameters (Table 11);

x_{ij} - Normalized value of the index under technological, economic, social, environmental parameters for each company.

Hence, the total integral indicator of innovation activity of agricultural companies can be calculated using the formula:

$$I_{\text{інн.акт.}} = I_{\text{тех.}} + I_{\text{екон.}} + I_{\text{соц.}} + I_{\text{екол.}} \qquad (7)$$

Thus the integral evaluation of innovative activity most successful businesses close to max: max = 1.

The integral indicator of innovation reflects the results of industrial and economic activity and innovation allows us to estimate the development of agricultural enterprises because the current system allows for farming, upgrading from domestic and foreign investment, building costs in the industry and others. With the value of the integral index farms are divided into 4 groups (Table 4):

1. $0 \le I_{\text{акт}} \le 0,3$ – Low or inadequate levels of innovation activity;

2. $0,3 < I_{\text{акт}} < 0,5$ – Average level of innovation activity;

3. $0,5 \le I_{\text{акт}} < 0,8$ – High level of innovation activity.

4. $I_{\text{акт}} \ge 0,8$ – Very high level of innovation activity (approaching to standard).

Table 4

Value of Integral Index of Level of Innovational Activity of Agrarian Companies of Zhytomyr region, 2012

№	$I_{\text{тех.}}$	$I_{\text{екон.}}$	$I_{\text{соц.}}$	$I_{\text{екол.}}$	Integral Value of Innovational Activity		Innovational Strategy
					Value	Level	
1	2	3	4	5	6	7	8
1	0,18	0,02	0,03	0,05	0,28	Low	*Strategy Support:* - restoration of main capital; - preservation of production and positions on the market.
2	0,17	0,04	0,04	0,05	0,30		
3	0,21	0,01	0,04	0,05	0,31	Average	*Strategy of Stabilization* - modification of production; - extension of production; - costs economy; - renovation of main and turnover assets.
4	0,20	0,07	0,05	0,02	0,33		
5	0,18	0,09	0,06	0,02	0,35		
6	0,15	0,07	0,08	0,05	0,35		
7	0,19	0,10	0,06	0,02	0,37		
8	0,25	0,10	0,06	0,02	0,43		
9	0,28	0,09	0,05	0,01	0,43		
10	0,34	0,04	0,05	0,01	0,44		
11	0,30	0,10	0,03	0,02	0,45		
12	0,27	0,15	0,06	0,02	0,50	High	*Strategy of development:* - extension of share of a certain product on market; - maintenance of quality and ecological products; - investments into other fields of economic activity.
13	0,27	0,19	0,03	0,01	0,51		
14	0,19	0,26	0,08	0,01	0,54		

Source: calculation of the author.

With the value of the integral index most farms Zhytomyr region, acting in innovation in recent years are a group of medium level innovation activity. This indicates some discrepancy as innovative activities. In economic practice farms situation where new plant varieties and animal breeds are the most common innovation. They can significantly improve the productivity of plant and animal productivity, however, such innovation is an innovation at the level of the individual companies. If we look at trends in the development of innovation at regional, national or international level, this kind of innovation is completely untapped and refers to "retroinnovations" (playing on the present level of apparently exhausted its means products or materials), and therefore cannot compete at the appropriate level with advanced domestic and foreign

agricultural companies. Each type of innovation is productive at some point there is some life cycle, but that the economy of the agricultural enterprises develop steadily, you must promptly change the type of innovation. For example, recently in developed countries such as USA, France begins to grow the value of social policy and its impact on the development of innovative companies. In this context, it is important to assess the novelty of a particular innovation in order to prevent the introduction of unclaimed market innovation.

Conclusions and further researches. Thus, the methodical approach to assessing the level of innovation activity allows us to estimate the actual impact of innovation and identify areas for improving the system of governance based on comparison with the standard values achieved on technical, economic, social and environmental policies of the company. The methodical approach can be used farm managers of different legal forms of ownership, implementing or carrying out preparatory activities for the implementation of innovation (technology of production, storage, processing of agricultural products, modernization of agricultural machinery, equipment, machinery and equipment, etc.) to identify the level of innovation activity of companies with regard to technological, economic, social and environmental factors.

Prospects for further research in this direction is the development of methods, techniques and measures to increase the level of innovation activity of agricultural companies.

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Yatskivska O. M. METHODICAL APPROACH TO ASSESSMENT OF THE LEVEL OF INNOVATION ACTIVITY OF AGRARIAN COMPANIES

Purpose. The purpose of the article consists in a substantiation of the concept of innovation active agrarian company and development of methodological approach to assessing the level of its innovation taking into account technological, economic, social and environmental factors.

Methodology of research. Methodological and theoretical basis of the research is the systematic approach to the study of innovation activity of agrarian companies, scientific works of domestic and foreign scientists. Research methodology is based on an interdisciplinary (analysis and synthesis, scientific abstraction, induction and deduction), and special methods of research: *abstract-logical*, *sociological survey, statistical-economic*, in particular the methods as a group, comparing method, *benchmarking method, integral method* and *tabular method* to display the analytical information.

Findings.. The article highlights the essence of the concept of innovation active agrarian company and on this basis is worked out methodical approach to an estimation of a level of its innovation. The system of indicators for evaluation of the innovativeness on the basis of such indicators of efficiency of innovations in agriculture, as: technological, economic, social and environmental has been proposed. It has been calculated integral indicator of the level of innovativeness of agrarian companies, by the value of which they are divided into four groups: low or insufficient level of innovation activity; the average level of innovation activity; high level of innovation activity, a very high level of innovation activity (close to the standard). Obtained in the process of integral evaluation results allows to define the strategic guidelines of economic development of agrarian companies, that will encourage the transition to a qualitatively new type of innovation development and indicate guarantee investments of investors in the innovative projects.

Originality. On the basis of benchmarking and integral methods of research has been developed methodical approach to assessment of the level of innovation activity of agrarian companies and have been provided recommendations on the choice of the optimal innovative development strategy.

Practical value. The proposed methodological approach can be used by managers of agrarian companies of various organizational-legal forms of property, which implement or carry out preparatory activities for introduction of innovative developments to identify the level of innovation activity of the company taking into account technological, economic, social and environmental factors as well as by regional government for the development of innovation policy and the implementation of measures to stimulate innovation activities in the agrarian sphere.

Key words: innovative activity, agricultural enterprise, innovation efficiency, integrated indicator, innovation strategy.