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Assessment of the Innovative Development of the Vegetable Farming Industry

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Abstract—**This paper provides a set of methodological tools including an assessment of the efficiency of introducing new technologies in vegetable farming, the main parameters of business entities, and a methodology of estimating the criteria, whose aggregation allows to define the strategic priorities of an organization's innovative development. The organizational and economic mechanism of the innovative development of vegetable farming should be based upon the use of a complex of scientific and technological, socioeconomic, organizational, and industrial regulatory methods of influencing the market actors that would allow to identify the most efficient ways of development, the interconnection and agreement of system elements considering the external and internal factors. The proposed system includes the industrial, economic, social, qualitative, medical, market-based, and intellectual criteria of assessment. The technique was piloted through the example of one of the leading enterprises of Vologda Oblast. The study provides the rationale for the necessity of developing the intellectual capital as a condition for the sustainable development of the vegetable farming industry.**

Keywords— vegetable farming; intellectual resources; competitiveness; scientific progress

I. INTRODUCTION

A place of importance in the world economy and politics belongs to food products, as well as their production, distribution, exchange, and consumption, which are all components of the functioning of the world system.

The agricultural industry, which includes various forms of property and uses complex methods of production management taking into account the level of enterprise development, has its own particular properties that are specific only to it and differ it from all other sectors of national economy. Specific features of managing agricultural production do not allow to quickly react to changes in the external and internal environment.

Russia's transition to market economy and joining the WTO made many sectors of agriculture unprofitable or marginally profitable, including vegetable production. On the one hand, the fierce competition between the domestic producers and the growing food imports keep vegetable prices down, making them more accessible to the consumer. On the other hand, the continuously rising cost of seeds, equipment, fertilizers, and energy force agribusiness enterprises to reduce their vegetable crop acreage or leave the market altogether. This puts the food security of the country in jeopardy. For this reason, it is necessary to increase the competitiveness of domestic vegetable production by means of efficient use of the resource potential and timely regulation of the central factors of agricultural production such as capital, land, and labor.

II. ASSESSMENT CRITERIA AND SYSTEM OF INDICATORS

Monitoring of innovative development presumes determining the summary assessment of all resources [1]. The economic efficiency of land use is characterized by the level of agricultural production and expressed through several indicators that are subdivided into three groups: natural, cost-based, and relative [2]. The rate of return is measured with a whole system of relative indicators characterizing the efficiency of the operation of an enterprise as a whole, the cost-effectiveness of various lines of business (production, commercial, investment, etc.), the profitability of producing particular types of products and services, and the efficiency of financial and material assets. The values of the rate of return indicators characterize the final outcomes of business activity in a more comprehensive way since they reflect the ration of the effect to the invested capital or consumed resources. They are used as a tool in investment policy and pricing, as well as to evaluate enterprise activity [3]. At the moment, there exists a great number of various techniques for assessing the innovative development of an agricultural enterprise, but a universal approach has not been developed. The foundation is formed by four basic methods that deal with the problem of assessing the effect of qualitatively heterogeneous resources on the performance indicators of the efficiency of operations and production [4]:

1. The sum of the economic evaluation of land and material resources, which reflects the quality of the indicator of the resource availability in businesses. This method has certain deficiencies, the main of which is that the economic and

statistical models designed using this indicator offer a rather indirect and, due to its fluctuations, rather relative impression of the level of development and use of the resource potential of a farming business. Furthermore, regression models can only be used to study homogeneous objects or objects with similar specialization, which does not allow to approach the assessment of inhomogeneous objects objectively.

2. Economic and statistical methods, which reflect the link between production resources and results, are, regardless of their substantial objectivity, not without their shortcomings, the main ones being [5]:

- economic and statistical models describe the integrated index of the resource potential of business not by directly summarizing the resources, but by means of the expected level of the performance indicator, i.e. only the regression coefficients with particular parameters can be interpreted as a contribution of one factor or another to the result. Since the share of every resource in such potential is unknown, the absolute term of the equation can not be broken down into factors;
- regression methods of assessment will only give a correct result in the framework of the totality covered by one model. In another model, the same resource unit will get a different assessment, which makes the regression assessment irreducible. Thus, the created statistical information is unreliable for practical use because the sum of elements is not equal to the sum of their partial sums.

It follows from the above that the economic and statistical models of the performance indicator produce only an indirect representation of the innovative development of a farming business.

3. Index methods of assessment of the innovative development factoring in the specifics of its constituent elements. The average resource availability index as an indicator of resource potential in one or another area is calculated by dividing the sum of indices by their number. However, it has a drawback, particularly, when determining production efficiency, it is impossible to trace if there is a cost-effective trend or, on the contrary, a cost-intensive one.

4. To provide a monetary value of agricultural resources and use it to determine their production capacity, the following two methods are generally used: the conversion of production resources into cost form by summing them up and the principle of interchangeability of particular types of resources.

The sum of the monetary values of land and labor resources and the cost of the main and circulating production funds is the resource potential of agriculture. Based on the materials of land appraisal surveys, land resources are assessed by type [6]. The information about the external environment includes macroeconomic indicators: economic development cycle, economic growth rate, level of inflation, average interest rates and availability of labor resources, average return on financial instruments, exchange rate values and dynamics, as well as monetary, tax, and tariff policies of the Russian Government and the regional authorities [7].

Macroeconomic indicators are used in the following analytical procedures [8]:

1. Assessment of the dynamics of the main indicators of business development, during which it is necessary to factor in the rate of economic growth. If an organization's revenue growth in real terms does not exceed the GDP growth rate, this can be considered as a sign the efficiency of the organization's activity.

2. Calculation of the real growth of an organization's financial indicators, which requires information about inflation. Calculating the real rates of the growth of revenue, costs, and salary requires inflation adjustment.

3. Assessment of the level of return on assets and investment capital and the weighted average cost of the organization's capital, which requires information about the average market level of these indicators.

4. Assessment of business efficiency, which requires comparing the rate of return on the organizations own capital compared with the average value across the economy.

5. Assessment of the level of financial leverage, calculating the indicators of which includes using the average interest rate for debt capital.

6. Assessment of investment efficiency, which requires the average value of return on investment by type: debt and equity securities, deposits, currency instruments.

7. Assessment of foreign trade activity if the organization is involved in it.

Industrial indicators are also necessary to analyze the external environment such as the position of the enterprise in the industry. Main industrial factors include: the industry's cycle of development; general trend of the industry's development; changes in production technology; unfavorable conditions; economic indicators within the industry; environmental requirements and issues; regulatory requirements; availability and cost of material and other resources needed for production; specific features of activity [9].

An enterprise's industrial affiliation affects such crucial business indicators as size, structure of the property and the sources of the organization's funding and revenue, correlation between asset sizes and financial outcomes, activities of the production, operational, and financial cycles, asset turnover, structure of costs by calculation items and elements, return on sales, workforce productivity.

Industrial indicators are used in the following analytical procedures [10]:

1. Analysis of an organization's production efficiency, where the decisive role belongs to the average values of resource intensity and productivity across the industry because the inefficient use of resources is the source of the general inefficiency of the business, its low profitability and rate of return.

2. Study of an organization's financial stability, which includes comparing this organization's absolute and relative values with the industry average ones. Financial stability

indicators vary across industries because they depend on the structure of property and revenue, which also reflects the specifics of each industry.

3. Assessment of an organization's efficiency based on the coefficients of return on assets, investment capital, equity, and weighted average cost of the organization's capital.

From the perspective of regional specifics of business, the most significant are the indicators of the average living standard in the region, which need to be accounted for when assessing the level of compensation within the organization. Besides, regional specifics can affect the market value of assets including the value of the real estate owned by the organization and cost of elements of circulating material assets [11].

Another methodological rationale for the monetary assessment is the principle of interchangeability of resources in the process of production. At the same time, it should be borne in mind that replacing some production resources with others can not be absolute.

Currently, scientists and economists are searching for the best solutions to assess innovative development. It is rational to use the step-by-step scheme [12]:

- formulation of the organization's mission and goal;
- defining the goals of analyzing the innovative development;
- analyzing the external environment of the enterprise: suppliers, competitors, consumers;
- analyzing the internal environment of the enterprise;
- development of a step-by step plan of using the resource potential;
- analyzing the elements of the enterprise's innovative development.

The problem of the efficient use of the resource potential during innovative development of the industry remains topical to this day because in the modern conditions, sustainable use and timely regulation of the main factors of agricultural production such as capital, land, and labor remain crucial for increasing an organization's performance efficiency.

Coming from what was said above, it is necessary to search for efficient ways of using the resource potential in agriculture that would facilitate the industry's innovative development [13].

Resource potential of an agricultural organization is a production complex that functions in the conditions of modern market where the power of entrepreneurial action acts as a determining factor in relation to labor and financial resources with the goal of increasing the efficiency of their use. Presently, the quintessential factor of intensifying vegetable production is the scientific progress, which has immediate effect on the efficiency of vegetable farming activity [14].

Intensification of this industry can encompass all achievements and developments of the progress in science and technology that would ensure the solution of the main problems of increasing the production and reducing its cost.

Innovative processes in vegetable farming facilitate the rationalization of the industry and are aimed at the technological, organizational, information-driven, managerial, and selection-related renovation of the industry.

The following types of innovation are distinguished:

- material and technical (technical retooling, new machinery, modern equipment, production control automation);
- technological (advancement of engineering, agronomic, and energy-efficient technologies);
- selection-related (producing new varieties of plants with higher reproductive power);
- organizational and information-driven (rationalization of the organizational structure and management methods, state regulation of the scientific progress, investment support);
- marketing (adjusting the activity in accordance with the requirements of the market);
- socioeconomic (improving labor conditions and safety, staff motivation, improving workforce productivity);
- environmental (preserving the environment, high product quality) [15].

In order to ensure the competitiveness of all businesses, it is necessary not only to increase the level of production intensity but at the same time use the non-material assets: innovative ideas, marketing studies, branded retailing, design, know-how, increasing the range of products and services, creative talents of the staff, new management and business methods, integrating vegetable product consumers with processing and retail enterprises. All of these are the intellectual resources of an enterprise that can make the main production factors to work to their highest ability [16].

Assessment of the efficiency of intensive technologies in vegetable farming should be carried out using the criteria that encompass the entire cycle from growing to entering the market [17]. In this respect, we propose seven assessment criteria: production, economic, quality, social, medical, market, and intellectual (Table 1).

The production block of indicators reflects the changes in production volumes and labor efficiency (labor intensity of performed operations).

The economic block shows how will the production costs and revenue from product sales change and where will the break-even point be due to changes in the production indicators.

TABLE I. CRITERIA AND INDICATORS OF THE EFFICIENCY OF INTENSIVE VEGETABLE FARMING TECHNOLOGIES

Values	Calculation
1. Production	
Increase in vegetable crop yield, tons (ΔY) Decrease in labor intensity of production, man-hour/ton (ΔLI)	$\Delta Y=Y_1-Y_0$ where Y_1 is the yield after introducing new technologies Y_0 is the yield before introducing new technologies $\Delta LI=LI_1-LI_0$ where LI_1 is the production labor intensity after introducing new technologies LI_0 is the production labor intensity before introducing new technologies
2. Economic	
Reserved decrease of production cost per unit, rub./ton (ΔC) Increase of revenue obtained from selling additional volume of products (ΔPv) Beak-even point, ton (BE)	$\Delta C=C_1-C_0$ where C_1 is the production cost after introducing new technologies C_0 is the production cost before introducing new technologies $\Delta Pv=Pv_1-Pv_0$ where $Pv_1$is the revenue for product sales after introducing new technologies $Pv_0$is the revenue for product sales before introducing new technologies
3. Qualitative	
Quality of vegetable products	Determined via a point rating system
4. Social	
Ensuring the food security of the country: annual production of vegetables per capita, kg/pers. (FS) Availability to customer: relation of average per capita income growth to vegetable price growth, % (K)	FS= MF/MN (the optimal value is 0.9-1.0) where MF is annual vegetable production per capita MN is the medical norm $\Delta SL=SL_1-SL_0$ where SL_1 is the level of salary after introducing new technologies SL_0 is the level of salary before introducing new technologies K=Ki/Kp, (optimal value is 1.0 and above) where Ki is the increase in average per capita income Kp is the rise of vegetable prices
5. Medical	
Effect of the quality and consumer properties of the product on human health (positive and negative)	Determined via a point rating system
6. Intellectual	
Coefficient of sufficiency of labor and leading expert staff, (Kst) Coefficient of the quality of the leading experts' training level, (Ked) Coefficient of the efficiency of on-the-job training, (Kt)	$Kst=\sqrt{(Ksa/Kse)*(Kla/Kle)}$ where Ksa is the actual number of specialists and managers Kse is the expected actual number of specialists and managers Kla is the actual number of laborers Kle is the expected number of laborers $Ked=\sqrt{\Sigma(Kihe/Kisa)}$ where Kisa is the actual number of specialists and managers of i-th speciality Kihe is the number of specialists and managers of i-th speciality with a higher education Kt=I/Ct where Ct are the costs of training staff I is the income from product sales
7. Market	
Availability of own retail chain Availability of a brand	Determined via a point rating system

The qualitative indicator is characterized by the compliance of products to state standards, "Organic produce" certificates awarded, and so on.

The *social* block of indicators describes the country's level of food security and the correlation between household income and vegedable product prices.

The medical criterion describes the influence of the positive (negative) effect on consumer health on consumer demand. Low-quality products may decrease the demand or even lead a complete refusal to consume the product due to the popular conviction that vegetables contain nitrates, traces of pesticides, or are genetically modified.

The intellectual block of parameters describes the sufficiency of labor resources, their level of education and cost efficiency: the ration of income to the costs of training personnel. This criterion is very important to assess the potential of the human resources available to the enterprise because employees are the actual bearers of the technologies and production experience and are the creators of further income.

The market criterion includes such indicators as the enterprise having its own retail store chain and a brand name. This allows to have own target market and regular customers, makes the product more recognizable, acts as quality assurance, and stimulates sales.

When assessing the efficiency of intensive technologies in vegetable farming, it is necessary to consider the summary effect of the criteria and indicators, as all of them are interconnected and eventually provide an unbiased evaluation of the efficiency of vegetable production, which allows to factor in both the producer effect and the consumer effect [19].

III. EVALUATION OF THE METHODOLOGY

The proposed methodology for assessing innovation development was practically evaluated through the example of the "Plemzavod Mayski" agricultural production cooperative in Volgograd Oblast.

This enterprise is one of the main producers of vegetable products in the region, making up for 40% of the total production by the region's agricultural businesses.

Regardless of the relatively high values of production indicators (product crop yield is above the average across the region), loss from vegetable product sales keeps accumulating.

The increasing disparity of prices that we described before makes the vegetable farming industry unprofitable for this enterprise, and thus it is necessary to develop a range of measures for introducing new technologies to decrease production value.

"Plemzavod Mayski" specializes in growing field vegetables: cabbage, carrots, beetroot. During the last years, cabbage production was the most unprofitable one as its price remains very low. It occupies 70% of the whole volume of vegetables in the structure of market products. The heaviest relative weight in cabbage production price belongs to material costs: 70%, including 30% for seeds and planting seedlings.

As an example of introducing intensive technologies and tapping into the enterprise's intellectual reserves, the author considered the technology of growing seedlings in a germination chamber that houses 250 thousand seedlings and costs 360 thousand rubles. The germination chamber allows to shorten the time of cabbage seed germination from four to two days, increase seedling survival rate after being planted in the field, and thus increase crop yield by 2%. This allows to decrease the "insurance fund" of the produced seedlings by 7%.

This way, the acreage of 50 ha previously required 1925000 seedlings before introducing this technology, including 10% for the case of seedlings dying due to windchill, drought, or other natural phenomena. After introducing this idea, the "insurance fund" can be reduced to 3%.

Based on the data provided, an assessment of the efficiency of the new technology of growing cabbage in "Plemzavod Mayski" was carried out according to the seven criteria presented above.

In the first year after introducing the new technology of growing seedlings, production cost per product unit, considering all costs of building the germination chamber in the current period, will decrease by 40 kop. per kg. and by 1 rub. 10 kop. in the second year. Accordingly loss from cabbage sales will also decrease (Table 2).

TABLE II. EFFICIENCY OF VEGETABLE PRODUCTION BY "PLEMZAVOD MAYSKI"

Indicator	Before introducing the technology	After introducing the technology	
		first year	second and further years
Crop acreage, ha	50	50	50
Crop yield, centner/ha	700	714	714
Seedlings needed together with the "insurance fund", pcs	1925000	1802500	1802500
Seedling cost, rub./pc.	3.5	3.7	3.5
Seedling cost for the entire acreage, thousand rub.	6737.5	6669.3	6308.8
Production cost of 1 kg. of cabbage, rub.	14.0	13.6	12.9
Disposal price of 1 kg. of cabbage, rub.	10.0	10.0	10.0
Income/loss from selling 1 kg, rub.	-4.0	-3.6	-2.9
Labor intensity of growing seedlings, man-hours	196	101	101

The break-even point after introducing the new concept will decrease by 298 tons or 7.7%. The labor intensity value of growing seedlings will have a downward trend, eventually making up 95 man-hours. The release of the workforce would allow to perform a large amount of work and increase the total productivity value.

Given the insignificant investments and the 2% growth of crop yield in one product type, we get the increase in the level of ensuring food safety, however, its value remains fairly low, which indicates the need for a more active introduction of the achievements of scientific progress (Table 3).

TABLE III. ASSESSMENT OF THE SOCIAL EFFICIENCY OF CABBAGE PRODUCTION AFTER THE INNOVATION BY "PLEMZAVOD MAYSKI"

Indicator	Before introducing the technology	After introducing the technology	Departure.
Mid-year population of Vologda Oblast, thousand people	1185.8	1185.8	-
Cabbage production by "Plemzavod Mayski", tons	3500	3570	70
Cabbage produced by "Plemzavod Mayski" per capita in Vologda Oblast, kg/pers.	2.95	3.01	0.06
Yearly vegetable production per capita in Vologda Oblast, kg/pers.	55.60	55.66	0.06
Provision of food security	0.39	0.40	0.01
Average per capita income in Vologda Oblast, rub. per month	27344	27344	-
Cabbage price, rub./kg	10.0	10.0	-
Availability to customer, %	100.0	100.0	-

The intensification of vegetable production and its industrial, economic, and social aspects, as well the market, medical, and qualitative ones depend on the last group of factors: the enterprise's intellectual resources, their stimulation and rational use.

Research showed that the number of specialists at "Plemzavod Mayski" and their level of education are on a sufficiently high level (Table 4).

TABLE IV. ASSESSMENT OF THE INTELLECTUAL RESOURCES OF "PLEMZAVOD MAYSKI" FOR 2017

Indicator	Expected	Actual	Departure.
Average staffing number of specialists and managers, pers.	70	69	-1
Average staffing number of laborers, pers.	465	460	-5
Number of specialists and vegetable farming specialists, pers.	4	4	0
Number of managers and auxiliary shop specialists, pers.	12	12	0
Number of specialists and vegetable farming specialists with higher education, pers.	4	3	-1
Number of managers and auxiliary shop specialists with higher education, pers.	12	10	-2
Coefficient of sufficiency of labor and leading expert staff, (Kst)	1.00	0.99	-0.01
Coefficient of the quality of the leading experts' training level (Ked)	1.00	0.91	-0.09

Consequently, the enterprise ahs the conditions and opportunities to introduce new technologies and shift towards intensifying the production of vegetables.

We studied the production, economic, social, and intellectual block in great detail and gave them a qualitative assessment. Further, we are going to analyze the qualitative characteristics that influence the production and sales of vegetables, particularly the market, medical, and qualitative criteria. For this reason, we are going to use the "logical method" (Table 5) Its essence can be reduced to the following: in the case of a positive value (answer), each criterion is given 1 point, in the case of a negative value, zero points.

TABLE V. ASSESSMENT OF THE EFFICIENCY OF THE MARKET, QUALITATIVE, AND MEDICAL COMPONENTS OF VEGETABLE FARMING IN "PLEMZAVOD MAYSKI".

Indicator	Value
Vegetable product quality: Meeting the state standards "Organic product" certificate awarded	1 0
Medical: Effect of the quality and consumer properties of the product on human health (positive and negative)	1
Market: Availability of own retail chain Availability of a brand	0 1

The qualitative components are generally above average, but the absence of own retail chain forces the enterprise to depend on wholesale sales and distribution networks. This makes "Plemzavod Mayski" uncompetitive in the market of vegetable products.

IV. CONCLUSION

The proposed technique for assessing the innovation development of vegetable farming industry allows to make substantiated management decisions to determine strategic priorities. Capital investments in an organization's intellectual resources will allow to increase production output, reduce production costs, and thus increase the company's competitiveness in the market.

References

[1] O.V. Gosteva, E.I. Akenteva, “Intellectual resources as the basis of the intellectual capital of the organization”, International research journal, vol. 6-3, 2015, pp. 34-35.

[2] O.V. Gosteva, E.I. Akenteva, “Methods of analysis of intellectual capital”, International research journal, vol. 6-3, 2015, pp. 37-40.

[3] S.M. Ryjkova, E.A. Sylko, “The market of vegetable production in Russia”, Vestnik OrelGAU, vol. 4, 2015, pp. 3-7.

[4] M.A. Karginova, “What does apply to the term «intellectual resourses» at present time?”, Modern problems of science and education, vol. 1-1, 2015, p. 462.

[5] N.V. Parakhin, “Intellektualnyi potentcial – kak resurs razvitiia APK” [Intellectual potential as a resource of the development of agriculture] Orel State Agrarian University Bulletin, vol. 6, 2007, pp. 15-18.

[6] E.A. Shchetinina, “Certain aspects of managing intellectual resources of an enterprise”, [Nekotorye aspekty upravleniia intellektualnymi resursami predpriiatiia], Izvestiia Volgogradskogo gosudarstvennogo tekhnicheskogo universiteta, vol. 11, 2006, pp. 93-95.

[7] I.Iu. Chazova, “Specifics of protected-ground vegetable production in the modern economic conditions”, [Osobennosti proizvodstva produktcii ovoshchevodstva zashchishchennogo grunta v sovremennykh ekonomicheskikh usloviiakh], Orenburg State Agrarian University Bulletin, vol. 4, 2010, pp. 172-175.

[8] L.R. Musina, “Production of protected-ground vegetable production as part of the program for food security of Bashkortostan” [Proizvodstvo ovoshchei zashchishchennogo grunta kak chast programmy obespecheniia prodovolstvennoi bezopasnosti Bashkortostana], Nikonov readings, vol. 19, 2014, pp. 180-182.

[9] I.Iu. Chazova, “Competitiveness as a system category of the efficiency of protected-ground vegetable production” [Konkurentosposobnost kak sistemnaia kategoriia effektivnosti proizvodstva ovoshchei zashchishchennogo grunta], Orenburg State Agrarian University Bulletin, vol. 3, 2012, pp. 189-192.

[10] S.Y. Dementiev, “Main directions of improving the efficiency raising organizational and economic mechanism of production vegetables in open field1-1”, 2016, pp. 156-160.

[11] K. Lee, D. Manuer, E. Xu, “Human capital relatedness and mergers and acquisitions”, Journal of financial economics, 2018, vol. 129, no. 1, pp. 111-135. DOI: 10.1016/j.jfineco.2018.03.008

[12] R. Roy, S. Shijin, “Dissecting anomalies and dynamic human capital: The global evidence”, Borsa Istanbul review, 2018, vol. 18, no. 1. pp. 1-32. DOI: 10.1016/j.bir.2017.08.005

[13] B. Herrendorf, T. Schoellman, “Wages, Human Capital, and Barriers to Structural Transformation”, American economic journal-macroeconomics, 2018, vol. 10, no. 2. pp. 1-23. DOI: 10.1257/mac.20160236

[14] S. Inwood, “Agriculture, health insurance, human capital and economic development at the rural-urban-interface”, Journal of rural studies, 2017, vol. 54, pp. 1-14. DOI: 10.1016/jjrurstud.2017.05.009

[15] D. Dimon, D. Shepherd, “Human capital theory and venture firms: Exploring «home rums» and «strike outs»”, Journal of Business Venturing, 2005, vol. 20, no. 1. pp. 1-21.

[16] M. Marvel, “Human capital and search-based discovery: A study of high entrepreneurship”, Theory and Practice, 2013, vol. 37, no. 2. pp. 403-419.

[17] M. Knoop, “Human resources management illustrated with special crops as an example”, Berichte uber Landwirtschaft, 2018, vol. 96, no. 2, pp. 1-21.

[18] H. Urbancova, R. Richter, L. Kucirkova, M. Jarkovska, “Employer branding in the agricultural sector: Making a company attractive for the potential employees”, Agricultural Economics, 2017, vol. 63, no. 5. pp. 217-227.

[19] N.A. Medvedeva, “Systems approach to forecasting agriculture: mechanisms and tools” [Sistemnyi podkhod k prognozirovaniiu selskogo khoziaistva: mekhanizmy i instrumenty], Dairy farming bulletin, 2016, No. 3(23), pp. 100–110.

[20] N.A. Medvedeva, “Shaping human capital as a condition for innovative development of the regional agricultural system” [Formirovanie chelovecheskogo kapitala kak uslovie innovatcionnogo razvitiia regionalnoi sistemy selskogo khoziaistve], Dairy farming bulletin, 2016. No. 4(24), pp. 151–159.