Investigation of Influence Factors on Agricultural Eneterprises Technological Processes Management

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Abstract—**The state of activity of agro-industrial complex (AIC) enterprises in the context of its components is investigated, on the basis of the analyses of changes in the main indicators of agricultural production, the complicate aspects of innovation activity of Ukraine in the agricultural market are identified, the components of technological processes of agricultural production of Ukraine are determined, the factors of influence of agricultural production are investigated on the basis of methods of descriptive statistics management of technological processes of the activity of AIC enterprises.**

Keywords—technological processes, agro-industrial complex enterprises, agricultural products, risks of agro-industrial production.

I. INTRODUCTION

It should be noted that the ability to effectively operate AIC enterprises is a potential property, which requires some efforts, as well as financial and technological means. In today's economic conditions of Ukraine, increasing the efficiency of production at a particular enterprise can be achieved mainly through the implementation and use of innovative technologies in the production of new types of competitive products and their effective management. The functioning of agribusinesses requires the application of new management principles with account of the technical and economic characteristics of technological processes, adapted to the conditions of operation of these enterprises. It is still necessary check the account the level of demand in the relevant markets; pricing strategy; effective methods of dissemination and promotion of innovative products.

Thus, it is possible to conclude that under the current conditions of the agribusiness enterprises, their effective management requires the creation of special approaches, the use of appropriate mathematical and software information tools [1] – [5]. Defined means will allow to substantiate managerial decisions on development and management of enterprises for the production or processing of raw materials in agricultural processes, to determine planned production volumes of innovative products, the degree of effectiveness of introduction of new technological processes in production in strategic and tactical planning of agro-enterprises [6] – [10]. The development and implementation of new ones, the refinement and improvement of existing approaches to the control of technological processes with the use of economic and mathematical modelling as the same information technologies, create the preconditions for enterprises to become processes of reproduction and give an additional impetus for innovative development and economic growth [8] – [11].

Analysis of technological innovation management is characterized by the creation, development and dissemination of innovation. Until now, the concept of "innovation" has attracted considerable interest from scientists around the world. Initially, American and European scholars as I. Perlaki [12], E. Rogers [13], B. Santo [14], B. Twiss [15], J. Schumpeter [16] and others. In the domestic literature, the concept of "innovation" began to be used later, although abroad this concept originated in the early XX century. in. During this period, the nature of innovation was more widely explored.

According to the scientific literature, the interest in the development and management of innovations in the world has grown a lot over the last some years/ It was attracted the attention of managers and scientists [17] – [20]. The emergence of new approaches to innovations based on the application of advances in information and communication technologies has catalyzed the dissemination of innovative technologies, innovative products and other elements of IP. Scientists S. Zott, R. Amit, and L. Massa [18] have become the developers and distributors of the concept of business modeling innovation through online resources. D.J. Teece notes that business modeling by innovation is an integral part of the economic behavior of the entity [19].

II. THE PRESENTATION OF THE MAIN MATERIAL

In order to analyze certain types of factors influencing the activities of AIC enterprises in order to further take these into account in the economic-mathematical model of

agricultural enterprises technological processes management (AETPM), the dynamics of the main indicators affecting the production of agricultural enterprises, a fragment of which is presented in the Table 1.

TABLE 1 - THE MAIN STATISTICAL CHARACTERISTICS OF THE DISTRIBUTION OF SPECIES RAW MATERIALS FOR ANIMAL HUSBANDRY

Indicator	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8
Average	1078,9	363,22	846,89	95,714	592,82	175,28	1925,5	12291,
Median	1074,5	337,94	839,1	75,19	587,37	169,3	1911,7	11761,
Dispersion	25377	5813,6	11361	3136,8	5566,5	588,98	65740	1,1671
Stand.deviation	159,30	76,247	106,58	56,007	74,609	24,269	256,39	1080,3
Koef. of variat. (%)	14,76	20,99	12,58	58,51	12,58	13,84	13,31	8,789
Standard. error	48,031	22,989	32,137	16,886	22,495	7,3173	77,307	325,73
Minimum	888,46	270,61	688,71	34,86	482,1	142,4	1597,0	11086
Maximum	1313,7	531,33	1075,7	196,02	753,0	214,1	2389,4	13714
Range	425,22	260,72	387,01	161,16	270,9	71,7	792,4	2628,4
Lower quartile	908,29	318,22	761,59	40,78	533,12	152,8	1723,2	11377
Upper quartile	1255,1	398,22	891,65	148,8	624,15	200,8	2143,8	13661
Stand. asymetr.	0,351	1,804	0,749	0,655	0,749	0,355	0,481	0,6114
Stand. excess	-0,975	0,930	0,831	-0,795	0,831	-0,856	-0,476	-1,239

A statistical analysis of the main components of the production process by processing enterprises generating risks (30 indicators) affecting the production of products by agro-enterprises was performed and the numerical characteristics of the distribution of their values were calculated.

The basic types of agricultural enterprises' products and the main types of raw materials for the production of these products are investigated on the basis of data for the period 2010 - 2018 by monthly breakdown: products made on the basis of animal husbandry; products made on the basis of vegetable raw materials; products made on the basis of mixed raw materials of husbandry crop and animal production; products from other types of agricultural raw materials (ARMs) [2].

The main products of the first group are beef and veal, fresh (steamed) or chilled, beef and veal, frozen, fresh pork (steamed) or chilled, frozen pork, meat and offal of poultry (fresh or chilled), m ' edible meat and poultry by-products (frozen), sausage products, processed milk, butter, unfermented and fermented cheese, fatty cheeses, dairy products, etc. The main raw materials for these products are cattle (steam) for steamed or chilled meat (y_1), cattle for frozen meat (cows) (y_2), pigs for steamed or chilled meat (y_3), pigs for frozen meat (y_4), poultry for fresh or chilled meat (y_5), poultry for meat and by-products of poultry (frozen) (y_6), meat (in slaughterhouse) (y_7), milk (y_8).

On the basis of the conducted analysis, the numerical characteristics of the distribution of values of the volumes of products from livestock raw materials and the volumes of their origin for these products were found (Table 2).

TABLE 2 - LIVESTOCK AND POULTRY LIVESTOCK AS OF JANUARY 1, 2018, THOUS. HEADS

Cattle, total	Cattle, including cows	Pigs	Sheep and goats	Bird, 100 thousand heads
25195	8527,6	19947	9003,1	255,1
24623	8378,2	19427	8418,7	246,1
23728	8262,6	17839	7829,1	243,1
22457	8057,2	16175	7236,6	214,6
21607	8077,7	15298	6862,6	190,5
19624	7818,3	13946	5574,5	164,9
17557	7531,3	13144	4098,6	149,7
15313	6971,9	11236	3047,1	129,4
12759	6264,8	9478,7	2361,8	123,3
11722	5840,8	10083	2026	129,5
10627	5431	10073	1884,7	126,1
9423,7	4958,3	7652,3	1875	123,7
9421,1	4918,1	8369,5	1965	136,8
9108,4	4715,6	9203,7	1984,4	147,4
7712,1	4283,5	7321,5	1858,8	142,4
6902,9	3926	6466,1	1754,5	152,8
6514,1	3635,1	7052,8	1629,5	162
6175,4	3346,7	8055	1617,2	166,5
5490,9	3095,9	7019,9	1678,6	169,3
5079	2856,3	6526	1726,9	177,6
4826,7	2736,5	7576,6	1832,5	191,4
4494,4	2631,2	7960,4	1731,7	203,8
4425,8	2582,2	7373,2	1739,4	200,8
4645,9	2554,3	7576,7	1738,2	214,1

The main products made on the basis of vegetable raw materials include: sunflower oil, flour, cereals, white crystalline sugar, non-denatured ethyl alcohol with an alcohol content of at least 80% vol.

The main plant resources for these products are sunflower seeds (y_1), cereals and legumes (y_2), oilseeds (y_3), sugar beets (y_4). Based on the analysis, their main statistical characteristics were found (Table 3).

Similar calculations are also made for products made from mixed raw materials. These products include: spreads and mixtures of fat, bakery products, margarine and similar products, biscuits and waffles, pasta without stuffing, not cooked or otherwise prepared, pasta stuffed, cooked or otherwise prepared (dried, frozen): ravioli, dumplings, etc.; couscous, confectionery made of sugar (including white chocolate), not containing cocoa and others. Raw materials of vegetable and animal origin are used for these products: cereals and legumes, eggs from poultry, sugar beets, sunflower seeds, milk, meat, oilseeds, etc.

Products from other raw materials include natural juices, including concentrated, blended natural juices, vodka, other spirits (drinking alcohol with an alcohol content of less than

45.4 vol.%; Alcohols obtained by distillation from fruits other than liqueurs, gin, wine grape), cotton yarn, etc. the ARMs for them are fruits and berries for fermentation, and for yarn it is wool.

TABLE 3 - THE MAIN STATISTICAL CHARACTERISTICS OF THE DISTRIBUTION OF SPECIES RAW MATERIALS OF PLANT GROWING

Indicator	Emissions from stationary sources of pollution			
	pollutants		*carbon dioxide*	
	thous. t.	*% to the total*	*thous. t.*	*% to the total*
All types of economic activity	4295,1	100,0	197618,0	100
of them mining and quarrying	921,2	21,4	4282,4	2,2
manufacturing industry including	1230,9	28,7	82082,6	41,5
including manufacture of food, beverages and tobacco	21,9	0,5	2041,2	1
production of coke and products	66,4	1,5	4823,8	2,4
oil refining	38,8	0,9	4941,5	2,5
metallurgical production	1004,6	23,4	60520,6	30,6
supply of gas, electricity, steam and air conditioning	1838,9	42,8	104413,6	52,8
transport, warehousing, postal and courier activities	166,5	3,9	4332,6	2,2
technological processes in mechanical engineering, woodworking, pulp and paper and food industry and in other sectors	3,943	57858,6	1,3	14,7
bread industry	0,232	2616,4	0,1	11,3
wine production	0,025	94,9	0	3,8
beer production	0,029	101,4	0	3,5
production of strong alcoholic beverages	0,026	371,5	0	14,3
other food industries	0,429	7479,6	0,2	17,4

Similar calculations of statistical analysis have been made for the main components that support the production process of AIC enterprises. By means of the analysis the average values of the volumes of raw materials, their maximum and minimum values, the median, the quadratic error, etc. are determined. Given the values of the medians and standard errors, the level of risk was justified. The calculated values make it possible to state the impact of the risks associated with the main components of the production of agricultural products of the agroindustrial complex and give the basis for their use in the model of AETPM.

Thus, the system of partial risk-determining indicators includes: production volumes of products of different types, volumes of ARMs of different types, volumes of consumed electricity and energy capacities of enterprises, prices of ARMs of different types, prices of basic products of production of agricultural enterprises prices for water, electricity, gas and other fuels, inflation index, bank discount rate.

It is well known that the environmental factor and the associated environmental risks can have a significant impact on the production of agro-industrial processes [21]. Let us investigate the risks of environmental pollution in agricultural production within Ukraine. Consider the structure of pollutant emissions across the country's industry, its agrarian sector, and the industry involved in the production and processing of ARMs. The main air pollutants in 2018 were processing and extractive industries (29% and 21% of harmful emissions respectively) and gas, electricity, steam and air conditioning (43%), as evidenced by such data (Table 4).

TABLE 4 - EMISSIONS FROM STATIONARY SOURCES OF POLLUTION BY TYPE OF ECONOMIC ACTIVITY

Indicator	y_1	y_2	y_3	y_4
Average	6298,09	42565,0	879,482	15462,0
Median	6364,0	41809,0	799,0	15468,0
Dispersion	5,5589E6	40746,9	798,221	15066,0
Standard. deviation	2357,73	12397,7	398,802	3658,92
oefficient of variation	37,4357%	29,1266%	45,3451%	23,6639%
Standard error	710,883	3738,06	120,243	1103,21
Minimum	3050,0	20234,0	417,8	10068,0
Maximum	11051,0	63051,0	1547,1	22421,0
Range	8001,0	42817,0	1129,3	12353,0
Lower quartile	4254,0	34258,0	515,2	13392,0
The upper quartile	8387,0	53290,0	1299,8	18439,0
Standard. asymmetry	0,9168	-0,1218	0,6268	0,4135
Standard. excess	0,0613	-0,1146	-0,8410	-0,1109

The analysis of the data for the last years (2009-2018) showed that the content of processing industry emissions in the country's industry is 29.18% on average, and of the AIC average 1.97% of the total amount of pollutants within the industry of Ukraine.

Let us consider the impact on the ecology of emissions of harmful substances of agricultural enterprises of the Kharkiv region. Based on the analysis of the volume of pollutant emissions into the atmosphere from stationary sources of pollution in 2018, the analysis of their content in the volume of all enterprises in Kharkiv region and its agricultural enterprises was carried out.

It is found that in 2018 city and region agro-enterprises produced 1926,601 tons of pollutant emissions, which is 0.975% of the emissions of all enterprises in the region (197601,175 tones). In turn, the emissions of all agricultural enterprises from the total volume of enterprises in the region averaged 0.0519%. This indicates a rather small impact of the activities of agricultural enterprises on the environmental status of the environment [22, 23]. Thus, the performed analysis on the example of the enterprises of Kharkiv region gives reason to disregard environmental risks in the general list of risks of enterprises for the production and processing of ARMs.

III. CONCLUSIONS

Thus, it can be concluded that the agro-industrial sector generates a rather small amount of pollutant emissions from its activities and has a relatively small impact on the

environmental situation as a whole, which indicates the insignificance or absence of environmental risks in the field of agricultural production and gives environmental reasons not to take into account when modeling in UTPA APK.

Thus, on the basis of the theoretical, logical and statistical analysis, the main risk factors that influence the activities of agricultural enterprises are substantiated. It can be concluded that the effect of these risk factors is: the impact on the production of finished products, the resource component used to produce products on the basis of technological innovation, and on financial resources aimed at technological processes. On the basis of the conducted research, a statistical analysis was made and statistical indicators characterizing the level of risks by the main types of products, raw materials used, prices, macroeconomic indicators (change in discount rates, inflation) and other factors of production were made. This gave reason to specify the risks of agricultural enterprises in the implementation of technological processes.

On the basis of the methods of descriptive statistics the basic components that provide the process of production of production by agricultural enterprises are investigated. Based on the performed statistical analysis, the analysis of the calculated numerical characteristics, including the mean values, variances, medians and modes, their deviations, standard errors and variances, coefficients of variation, etc., indicates the heterogeneity, non-uniformity and non-stationarity of the values of these characteristics. The analysis made it possible to substantiate the existence of types of risks associated with the main components of production of agricultural products. The study of the nature of behavior of the main constituents on which the functioning of enterprises depends, has shown considerable difficulties in constructing the law of distribution of these quantities and, as a consequence, determining the level of probabilities of their manifestation and other stochastic characteristics, including. influenced the choice of models from the deterministic class, and the rejection of stochastic models for use in the modeling of UTPA.

Based on the statistical analysis, it is possible to conclude that the system of main partial indicators determining the factors of influence include: volumes of used ARMs of different types, volumes of consumed electricity and energy capacities of enterprises, prices of ARMs of different types, prices of basic agricultural products, prices for water, electricity, gas and other fuels, inflation index, bank discount rate, etc. At the same time, the study of the impact of environmental factors and related environmental risks on agro-industrial production within Ukraine and on the example of the Kharkiv region enterprises shows that the activity of agricultural enterprises on the environmental status of the agricultural sector is rather insignificant. Thus, the performed analysis gives the reason not to take into account the ecological factor and "ecological" risks when modeling in the management of IP of enterprises for production and processing of ARMs.

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