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**INNOVATIVE
ACTIVITY OF
ENTERPRISES OF
FOOD INDUSTRY
IN UKRAINE:
STATE AND
TRENDS OF
DEVELOPMENT**

The current stage of development of the national economy indicates the growing role of scientific developments in ensuring the effective functioning of enterprises, including food products. The introduction of science-intensive technologies leads to the expansion of existing and creation of new markets and increase production, which ensures the competitiveness of innovative enterprises. Given the place of food industry enterprises in the technological chain, the production of innovative food products has a positive impact on the development of food enterprises and other economic activities, stimulating research and investment in related sectors of the economy.

One of the factors of innovative activity of enterprises is the activity of scientific research, which is reflected in the development of science-intensive industries and the introduction of science-intensive products. Given the cyclical process of research, the stage of development of new technology, characterized by a high level of costs for research, is replaced by its introduction into production, accompanied by a restructuring of the production complex with subsequent changes in cost characteristics of products. As a result of the introduction of science-intensive products and the development of science-intensive industries, enterprises gain sustainable competitive advantages and ensure sustainable economic development in the long run.

The purpose of this study is to analyze the innovative activity of food industry enterprises in Ukraine and the factors that determine it. The study is based on the hypothesis of the relationship between the introduction of innovations in the industry and research indicators. The study was conducted in the following sequence:

1. Indicators of innovative activity of food industry enterprises of Ukraine are analyzed.
2. The dynamics of science intensity of GDP, financing of expenditures on research and development in Ukraine is studied.
3. The dependence between the introduction of innovations in the food industry and the results of research and development in Ukraine is checked.

To study the innovative activity of enterprises of the food industry of Ukraine, data on the number of innovatively active enterprises in general and by areas of innovation, as well as the cost of innovation by the source of their income were used. The study period 2015-2019.

As a result of the conducted researches, the conclusion on a slow introduction by the enterprises of Ukraine of innovative developments in the practice of an activity is made. According to the Global Innovation Index 2020, Ukraine ranked 45 out of 131 positions in the ranking of innovative economies of the world [1], and although increased the rating by two positions (47th place in 2019), has low values in terms of JV-strategic alliance deals/bn PPP \$ GDP (113 positions), state of cluster development (91 positions), GERD financed by business, % (58 positions).

Innovatively active enterprises in Ukraine account for a small share. During 2015-2019, their share in the total number of industrial enterprises did not exceed 16.6% and tended to decrease in recent years. The analysis in terms of economic activities shows that manufacturing

enterprises belong to the group with the highest share of innovation-active enterprises. During the study period, the share of innovatively active food industry enterprises in the total number of such enterprises was 16.8...24.6%, in the processing industry – 18.9... 25.9% (Table 2.3).

Table 2.3

Dynamics of innovatively active enterprises for food production in Ukraine for 2015-2019, %

Indicator	Year				
	2015	2016	2017	2018	2019
Number of innovatively active industrial enterprises by areas of innovation by type of economic activity, units, total	824	834	759	777	782
including processing industry, units	751	745	680	737	693
food production, units	178	170	167	191	131
The share of innovatively active enterprises for food production in the composition of innovatively active industrial enterprises					
total	21,6	20,4	22,0	24,6	16,8
processing industry	23,7	22,8	24,6	25,9	18,9

Source: compiled independently according to [2-5]

At the same time, there is a general tendency to reduce the number of such enterprises and their share in the innovative enterprises of Ukraine. Against the background of slowing down the innovative activity of enterprises in general, the rate of reduction of innovatively active enterprises in the field of food production significantly exceeds this figure for enterprises in the processing industry. The reduction of innovatively active enterprises in 2015-2019 was noted by economic activities as a whole by 5.1%, in the segment of processing industry – by 7.7%, in the segment of enterprises producing food products – by 26.4%.

Note the peculiarity of the organization of research in the food industry. During 2015-2019, most of the innovative enterprises in this area spent money on the purchase of ready-made solutions in the form of machinery, equipment and software, which is generally in line with trends in the manufacturing industry and the economy of Ukraine as a whole. At the same time, a small share of enterprises is engaged in the organization of internal developments. The share of food industry enterprises that spent money on internal research and development in

2019 was 3.8%, while the cost of purchasing machinery and equipment – 60.3% (Table 2.4).

Table 2.4

**The structure of enterprises by areas of innovation for 2015-2019,
%**

Indicator	Year				
	2015	2016	2017	2018	2019
The number of innovatively active industrial enterprises by areas of innovation by type of economic activity					
total	100	100	100	100	100
including processing industry	100	100	100	100	100
food production	100	100	100	100	100
of them spent money on internal research, total	18,3	27,8	17,1	28,1	15,6
including processing industry	19,3	29,8	18,1	28,9	16,9
food production	7,3	11,2	13,8	6,8	3,8
external research, total	8,5	12,4	8,2	8,5	8,8
including processing industry	7,6	12,5	7,6	8,4	7,6
food production	3,9	6,5	1,8	3,1	4,6
of them spent money on the purchase of machinery, equipment and software, total	56,7	70,7	65,9	41,2	64,7
including processing industry	55,1	68,9	63,8	41,4	63,2
food production	51,7	75,3	65,3	39,8	60,3

Source: compiled independently according to [2-5]

Despite the reduction in the number of innovatively active enterprises of the food industry during 2015-2019, the costs of innovation in this segment increased. Moreover, it is more active than for enterprises in general and enterprises of the processing industry. During the analyzed period, the cost of innovation for food industry enterprises increased 1.9 times from UAH 1.5 billion in 2015 to UAH 2.9 billion in 2019, for enterprises by type of activity – by 2.9%, for manufacturing enterprises decreased by 16.5% (Table 2.5).

Regarding financing, the main source of income for innovation activities for both enterprises by type of economic activity and food industry is the company's own funds. According to calculations for the segment of food production, the share of own funds in the total cost of investment activities is 81.0...95.9% over time. It should also be noted the growing role of credit resources in innovation. During the analyzed period, the share of loans in the total financing of innovations in the

food industry increased from 4.0% in 2015 to 15.5% in 2019.

Table 2.5

Dynamics of costs for innovation of innovatively active enterprises for food production in Ukraine for 2015-2019, %

Indicator	Year				
	2015	2016	2017	2018	2019
Expenditures of innovatively active industrial enterprises by areas of innovation by type of economic activity, UAH billion total	13,8	23,2	9,1	12,2	14,2
including processing industry, UAH billion	13,2	21,2	7,9	11,1	11,0
food production, UAH billion	1,5	2,2	1,4	1,3	2,9
The share of costs of innovatively active enterprises for food production as part of innovatively active industrial enterprises					
total	11,2	9,4	15,4	11,0	20,2
processing industry	11,7	10,3	17,8	12,1	26,1

Source: compiled independently according to [2-5]

Calculations show significant fluctuations in the specific costs of innovation for food production enterprises during 2015-2019 and their generally upward trend. According to 2019, this indicator is set at UAH 21.9 million per one innovatively active food industry enterprise per year, which is 1.2 times higher than the same indicator for enterprises by type of economic activity in Ukraine, and 1, 4 times higher than the same figure for manufacturing enterprises.

Indicators of the dynamics of science-intensiveness of GDP, as well as the volume and structure of research expenditures in Ukraine, were used to evaluate scientific research.

Research to determine the role of science in the development of the country's economy uses the indicator of the knowledge intensity of GDP, which is calculated as the ratio of research and development costs to total GDP. As noted in publications [6, 7] in the case that this indicator is defined at the level of 0.4-0.5%, science performs a socio-cultural function; 0.6-0.9% – supports the formed technological potential; with a value above 0.9% – provides economic development of society [6, 7].

The combination of information on the number of innovative enterprises and the cost of innovation makes it possible to determine the specific cost of innovation by enterprises in Figure 2.10.

Table 2.6

The structure of costs for innovation of innovatively active enterprises for food production in Ukraine by sources of income for 2015-2019, %

Indicator	Year				
	2015	2016	2017	2018	2019
The structure of costs for innovation of industrial enterprises by sources of funding by type of economic activity					
total	100	100	100	100	100
including the processing industry	100	100	100	100	100
food production	100	100	100	100	100
Including at their own expense, in total	97,2	94,9	84,5	88,2	87,7
including the processing industry	97,4	95,3	83,5	89,2	87,0
food production	95,9	81,0	90,9	89,9	84,0
at the expense of loans, in total	0,8	2,7	6,5	3,9	6,0
including the processing industry	0,9	2,7	7,6	3,3	6,3
food production	4,0	17,1	8,1	8,8	15,5

Source: compiled independently according to [2-5]

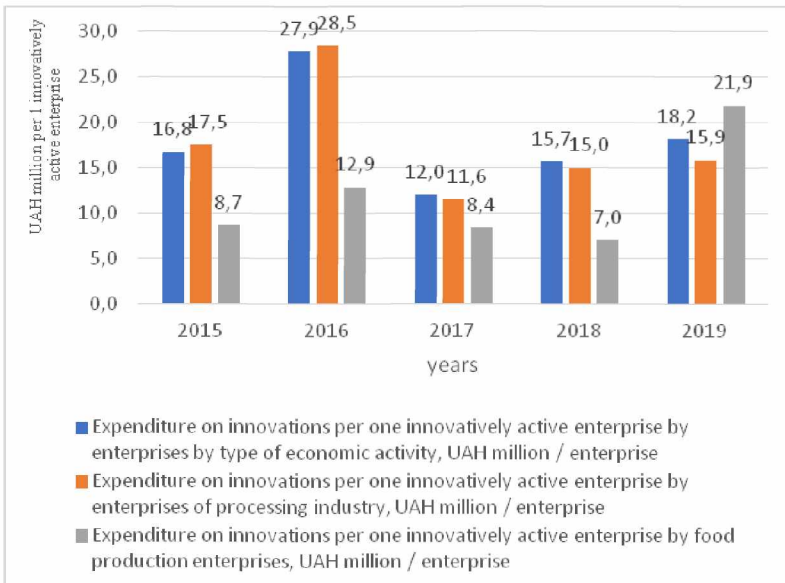


Figure 2.10 Dynamics of innovation costs per one innovatively active enterprise for food production in Ukraine for 2015-2019

Source: compiled independently according to [2-5]

Analysis of the knowledge intensity of Ukraine's GDP shows its low values and decrease over time. The Law of Ukraine "On Scientific and Scientific-Technical Activity" (Article 48 "Financial Support of Scientific and Scientific-Technical Activity" item 2) states that the state provides budget funding for scientific and scientific-technical activity in the amount of not less than 1.7 percent of the gross domestic product of Ukraine [8]. At the same time, the analysis shows that during 2010-2018 the value of science-intensive GDP did not exceed 0.75 and was 0.47 in 2018, which is 3.6 times less than the established norm (Figure 2.11).

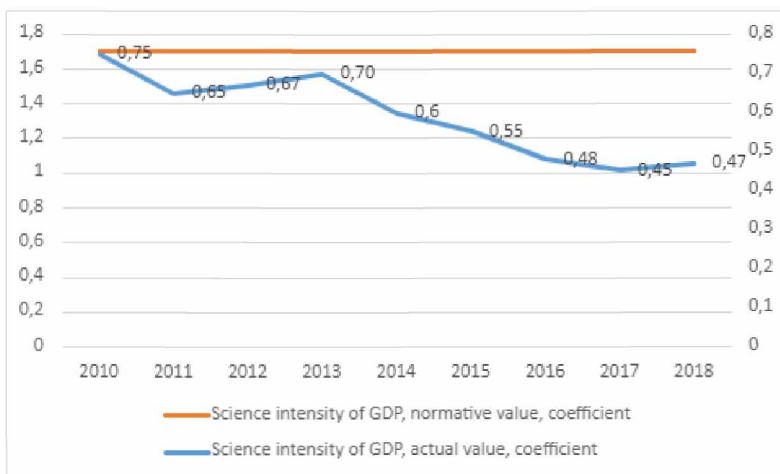


Figure 2.11 Dynamics of knowledge intensity of GDP of Ukraine
Source: compiled according to [5]

The relationship between the introduction of innovations in the food industry and research indicators was tested using the method of pairwise correlation analysis, the essence of which is to study the relationship between factor and performance characteristics. In this study, the factor is the level of expenditure on research and development (science-intensive GDP), the resultant – indicators of innovative activity of food industry – the number of innovatively active food industry, the share of innovatively active food industry, the cost of innovation that account for one enterprise of the food industry.

The author's hypothesis is that the increase in spending on research and development is a stimulus for innovation in the real sector as a whole and the food industry segment in particular. Information for studying the dependence of innovative activity of food industry

enterprises on the activity of financing research and development is given in Table 2.7.

Table 2.7

Information for the study of the correlation between the innovative activity of food industry enterprises and the level of knowledge intensity of GDP

Year	Science intensity of GDP, coefficient	Number of innovatively active enterprises of the food industry, units	Expenditures on innovations of food industry enterprises, UAH billion	Expenditure on innovations per one innovatively active enterprise by food production enterprises, UAH million / enterprise
	X	Y_1	Y_2	Y_3
2010	0,75	352	0,61	1,7
2011	0,65	384	0,93	2,4
2012	0,67	420	1,57	3,7
2013	0,70	398	1,70	4,3
2014	0,60	334	2,17	6,5
2015	0,55	178	1,5	8,7
2016	0,48	170	2,2	12,9
2017	0,45	167	1,4	8,4
2018	0,47	191	1,3	7,0

Source: compiled on the basis of [2-5; 9-11]

The results of the correlation between the innovative activity of the food industry and the level of knowledge intensity of GDP are shown in Table 2.8.

The studies confirmed the hypothesis of the relationship between the innovative activity of food industry enterprises and the level of the knowledge intensity of GDP. There is a high direct relationship between the level of the knowledge intensity of GDP and the number of innovatively active enterprises of the food industry (0.893); high feedback, however, between knowledge intensity and the cost of innovation per one innovation-active enterprise (−0.836); noticeable feedback – between knowledge intensity and the cost of innovation of the food industry (−0.414). The results of the calculations indicate the relevance of further research in this area, namely the study of the impact

of knowledge and innovation on the sustainable development of the food industry.

Table 2.8

The results of the correlation between the innovative activity of the food industry and the level of knowledge intensity of GDP

X_1	X_1	Y_1	Y_2	Y_3
X_1	1,000			
Y_1	0,893	1,000		
Y_2	-0,414	-0,239	1,000	
Y_3	-0,836	-0,834	0,694	1,000

Tags:

X_1 – knowledge intensity of GDP, coefficient;

Y_1 – the number of innovatively active enterprises of the food industry, units;

Y_2 – costs for innovations of food industry enterprises, UAH billion;

Y_3 – costs of innovations per one innovatively active enterprise by food production enterprises, UAH million / enterprise.

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