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Ukrainian Agro-Food Sector in the Context of Global Patterns of Environmental Innovation Development

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Abstract

The structure of the process of introducing innovative technologies in the agricultural sector, the competitive position of Ukraine in the world rankings of the development of agricultural science and training of personnel for the needs of the agro-industrial complex are considered and analyzed. Scientific and patent-investment activities of enterprises of the agro-industrial complex of Ukraine are studied. The methodology of bringing the mechanism of analytical and statistical observation of the state of innovative economic development in line with the standards of the Organization for Economic Cooperation and Development and the EU

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is analyzed. The main strengths and weaknesses of innovative activity of the agricultural sector of Ukraine are identified. As a result of the study, the authors propose adaptive changes in the process of implementing environmental innovations in the rational use of natural resources in the agricultural sector.

Keywords: agro-industrial complex, innovation, statistic, sustainable development, expenditure

JEL: O32, Q13, Q16, Q56

Introduction

The agro-food sector of the Ukrainian economy is an export-oriented sphere, the stability of which is ensured by the activity of innovation processes.

"Strategy for the development of the sphere of innovation activity for the period up to 2030" (*Strategy of Development…* 2019) notes that it is the knowledge and results of scientific research that are the basis of the Ukrainian innovative competitiveness of the agricultural sector, and Ukraine has a number of competitive advantages, namely human capital, market capacity, the ability to innovate, the availability of educated personnel, scientific schools that provide the opportunity to obtain an innovative intellectual product. The above-mentioned strategy is complemented by "Strategy for the development of exports of agricultural products, food and processing industry of Ukraine for the period up to 2026", the implementation of which provides for stimulating the use of innovative approaches and technological solutions in the production of food and processing industry products. These national strategies have become a kind of response to the "Agenda for sustainable development until 2030" adopted by the UN General Assembly in 2015, "Goal 2. Eradicating hunger, ensuring food security and improving nutrition, promoting rational farming" and "Goal 9" (Fonseca, Domingues, and Dima 2020). Creating a sustainable infrastructure, promoting comprehensive and sustainable industrialization and innovation" that actualize the chosen research topic.

The purpose of the article is to determine the innovation profile of the agri-food sector of the national economy and the main components that form the determinants of the innovation process.

Methods of research. To achieve this goal, general and special research methods were used. In particular, empirical (comparison and measurement), complex (analysis and synthesis) and theoretical (reflection of reality in thinking) research methods were used. Economic and statistical methods (analysis of dynamics series, grouping, graphical methods) were also used.

Literature review

Gradual innovation has always been at the heart of agriculture. From the beginning, farmers tried to improve the use of plants and animals for human consumption. Using trial and error breeding, they slowly domesticated different species of plants and animals. This process of millennial domestication has led to a huge expansion of cultivated fields, but only with a few species of homogeneous crops and the use of mainly five species of animals in animal husbandry. Along with gradual innovation, over the last few hundred years, agricultural research has led to many radical innovations in agriculture. These innovations, from mechanization to hybrid varieties, and from the Green Revolution to modern biotechnology, have shaped traditional agriculture worldwide. However, in recent years, especially these radical innovations have caused a lot of criticism from various types of NGOs and politicians. The main points of criticism of the modern agro-industrial complex relate to the use of pesticides and fertilizers, soil degradation and the use of genetically modified plants (Gremmen, Blok, and Bovenkerk 2019).

As a result, environmental innovations aimed at adapting all parts of the agro-industrial complex to modern environmental problems and increasing its competitiveness based on the paradigm of sustainable development have an increasingly important role in modern research.

Environmental innovations of the agricultural sector mean new or significantly improved low-waste technological processes and technologies, as well as resource-saving innovations, the implementation of which reduces the impact of the agro-industry on the natural environment. The innovativeness of countries and individual sectors of the economy is evaluated and compared using the EU Innovation Scoreboard.

According to a study by the Inter-American Institute for Cooperation on Agriculture (*Innovation in agriculture…* 2014), environmental innovations that provide environmental improvements are classified like ordinary ones using classification criteria that identify their species structure, typology, and implementer. In agriculture, innovations are mainly associated with new plant varieties, breeding new animal breeds, new equipment, new resource-saving technologies, the use of which changes the characteristic properties of agricultural products, but do not lead to the appearance of new types of products.

Ensuring innovative development includes two interrelated mechanisms: the mechanism for developing innovative projects, which is a source of supply in the innovation market, and the mechanism for implementing innovative developments, which creates a demand for innovation (Krysko 2009; Sevryukova and Sakun 2013) (Chart 1) and, to begin with, it should be noted that the agro-industrial complex consists not only of crop and livestock production, it represents a complex structure (Martusenko and Pohrishchuk 2015).

Results

The process itself is implemented through various forms and methods of organization, training of scientific personnel, promotion of research and development work, development of entrepreneurial activity in the scientific and technical sphere and state support for the creation, distribution, implementation and development of agricultural innovations through their popularization and financial assistance.

It should be noted that not all agricultural innovations are of an environmental nature or reduce the impact on the environment, so in a comprehensive analysis of the links in the process of introducing innovative technologies in the agricultural sector, the eco-innovations should be highlighted.

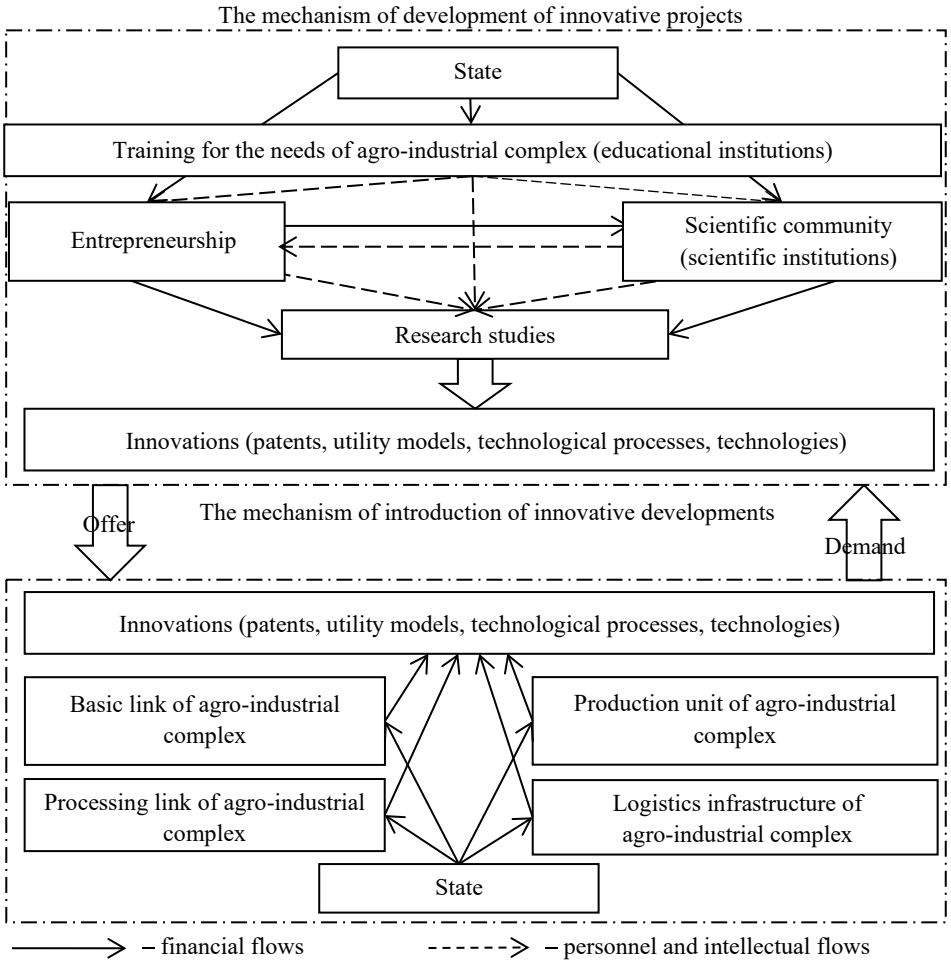

Chart 1. Structure of the process of introducing innovative technologies in agricultural sector

Source: created by the authors.

Assessment of scientific activity of Ukraine in the field of agro-industrial complex

Human resources scientific and technical potential for innovation is the key to the success of the state in world markets (Samilyk 2013). The highest ratio of students of the higher educational institutions of agro-industrial complex to the total number of students falls on the fifth level of higher education (junior specialist) (Table 1).

Table 1. Summary information on the number of students of the higher educational institution of the agro-industrial complex and the total number of students in Ukraine in 2018 and 2019 (5–8th level of education)

Tertiary education (levels 5–8)	2018				2019			
	Total	A.S.*	Total	A.S.	Total	A.S.	Total	A.S.
5	64,950	7,218	318,760	24,819	387	43	355,607	29,221
6	177,725	8,009	568,605	23,477	18,325	1,445	708,011	27,448
7	34,913	269	357,297	17,933	20,967	124	336,409	19,124
8	4,506	179	19,468	962	4,506	179	19,468	962
Total								
for all science	1,264,130				1,466,064			
for agricultural sciences	67,191				78,638			

Notes: * A.S. is for agricultural sciences.
Source: European Commission database (n.d.); State Statistics Service of Ukraine (2019).

Analyzing the table we can conclude that in the country are stable training of personnel for the needs of the agro-industrial complex. A comparison of the activities of Ukraine and other countries of the world in the field of training personnel for the needs of the agro-industrial complex is presented in Table 2.

Table 2. Ratio of students of agro-industrial complex training programs of higher educational institutions to the total number of students by countries in 2018 and 2019 (5–8th level of education)

Countries	levels 5–8		level 8	
	2018	2019	2018	2019
Belgium	2.1	2.1	3.2	3.2
Bulgaria	2.7	2.6	2.4	2.6
Czechia	3.6	3.6	3.5	3.7
Denmark	1.2	1.2	7.7	7.1

Countries	levels 5–8		level 8	
	2018	2019	2018	2019
Germany	1.5	1.5	3.0	3.0
Estonia	2.1	2.1	5.0	5.3
Ireland	1.6	1.7	2.0	1.9
Greece	4.0	4.1	2.4	2.2
Spain	1.4	1.3	2.7	2.5
France	1.2	1.5	1.0	0.0
Croatia	4.0	3.4	3.7	3.6
Italy	2.7	2.6	4.5	4.6
Cyprus	0.6	0.5	1.7	1.7
Latvia	1.7	1.6	3.2	2.8
Lithuania	3.3	3.1	4.5	4.8
Luxembourg	1.8	2.7	0.0	0.0
Hungary	4.0	3.8	4.2	4.1
Austria	1.4	1.4	2.6	2.6
Poland	2.0	2.0	3.1	3.1
Portugal	2.2	2.2	1.7	1.7
Romania	4.7	4.5	5.1	4.2
Slovenia	3.2	3.1	0.5	0.6
Slovakia	2.6	2.6	3.1	3.3
Finland	2.3	2.3	2.4	2.5
Sweden	1.0	0.9	1.5	1.5
Iceland	1.2	1.2	0.0	0.0
Norway	0.8	0.8	1.4	1.5
Switzerland	1.2	1.2	1.8	1.9
United Kingdom	1.1	1.1	1.1	1.1
Serbia	3.4	3.3	5.0	4.8
Turkey	2.1	2.2	3.9	2.9
Bosnia and Herzegovina	4.3	4.0	1.6	2.0
Ukraine	5.3	5.3	4.8	4.7

Source: European Commission database (n.d.); State Statistics Service of Ukraine (2019).

The visual representation of the material shows that in terms of 5–8th educational levels, Ukraine ranks first, and in terms of the indicator that was calculated only for 8th level of education (postgraduate and doctoral studies), Ukraine is the fifth, only after Den-

mark, Estonia, Lithuania and Serbia. That is, the level of providing the Ukrainian education system with personnel for the needs of the agro-industrial complex, both specialists and scientists, is quite high.

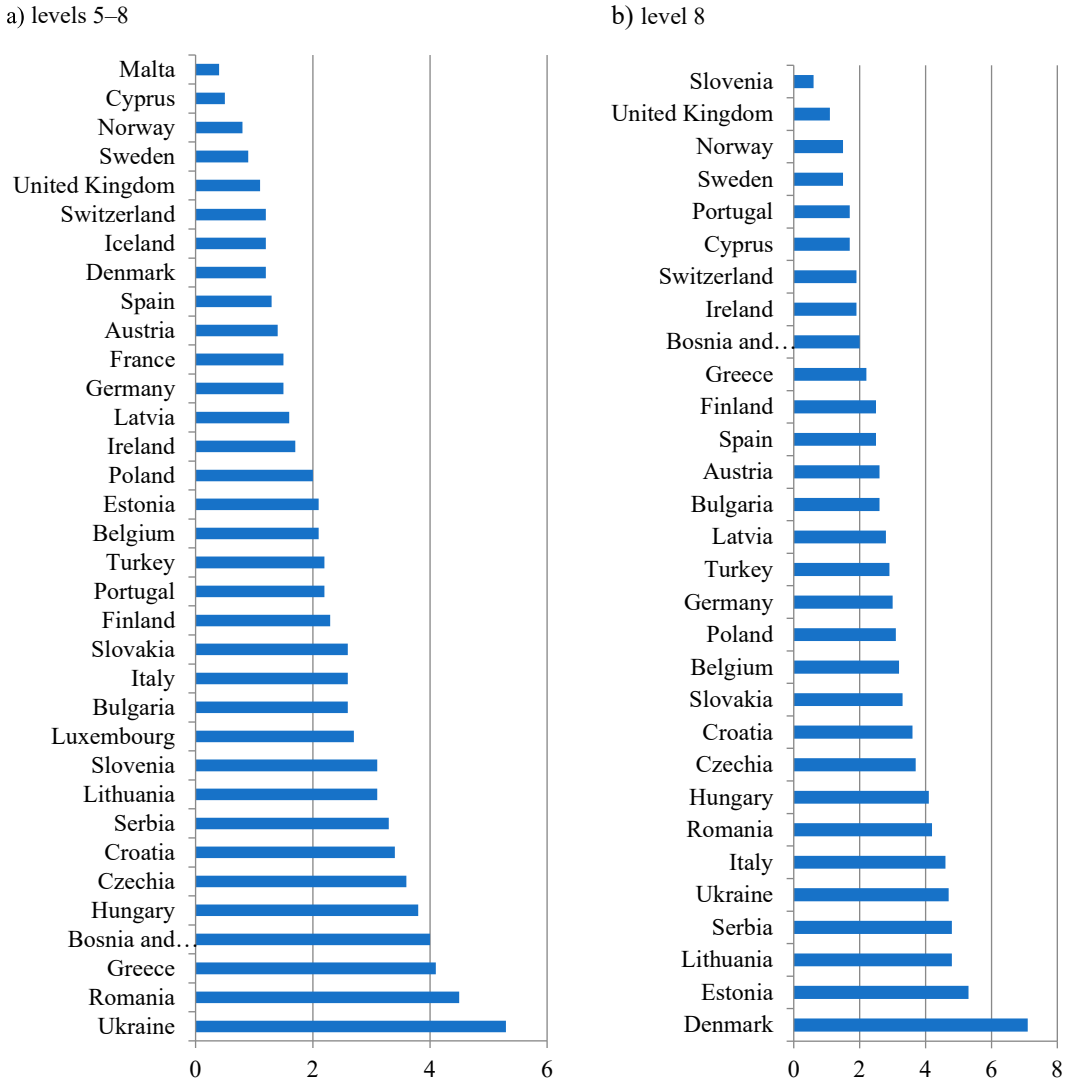

Chart 2. Ratio of students of agro-industrial complex training programs of higher educational institutions to the total number of students in the world in 2019

Source: European Commission Database (n.d.).

According to this indicator of financial support for the performance of research works (hereinafter referred to as – the Research), Ukraine ranked the tenth in 2018, after the Czech Republic, Croatia, Hungary, Poland, Portugal, Romania, Slovakia, Serbia, Turkey. In terms of agricultural research costs in terms of total research costs by countries, Ukraine ranked third after Serbia, Latvia and North Macedonia (Charts 3 and 4).

Thus, agricultural sciences make a significant contribution to the scientific activities of Ukraine, but in general, the level of research costs in the country is low.

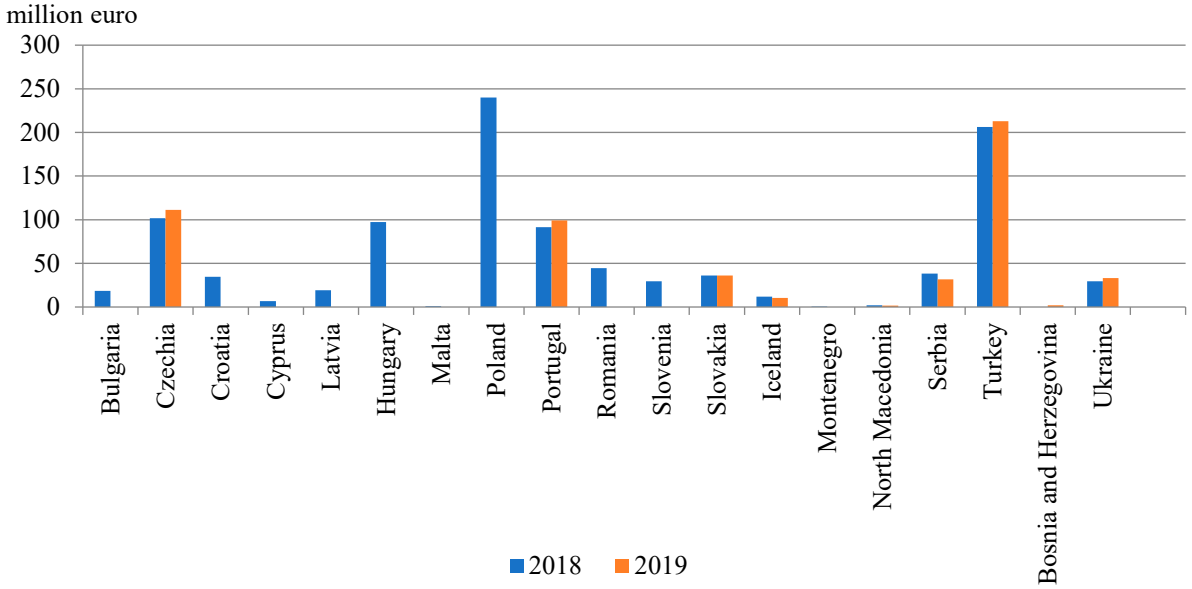

Chart 3. Expenditures on agricultural research by countries in 2018 and 2019

Source: European Commission database (n.d.); State Statistics Service of Ukraine (2019).

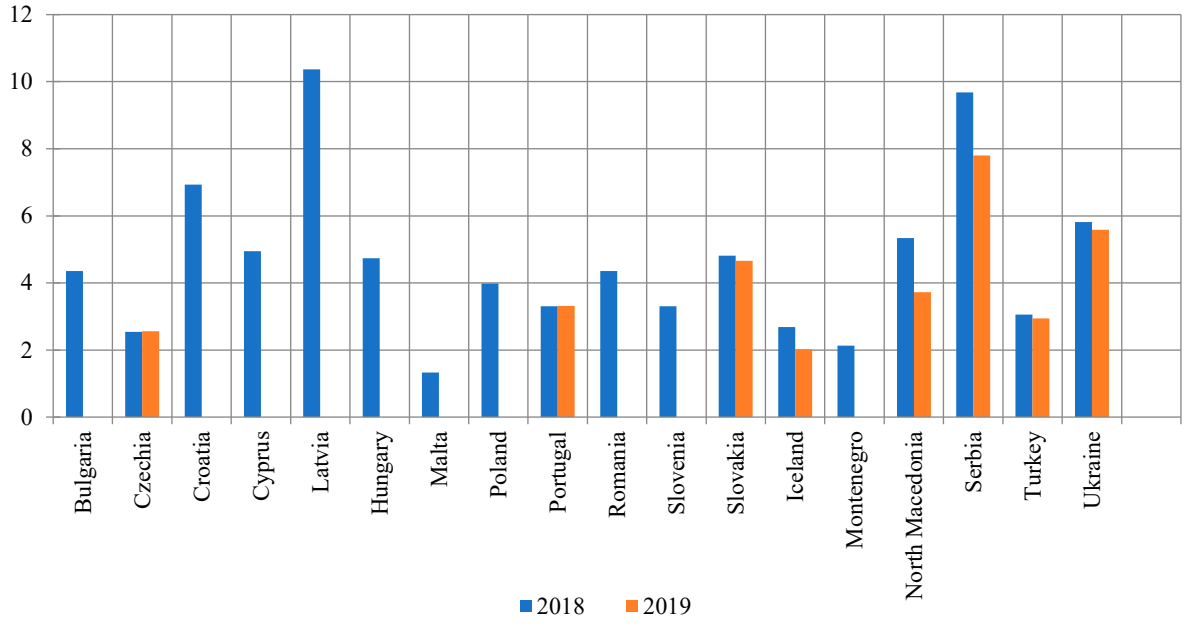

Chart 4. Percentage of agricultural research costs to total research costs by countries in 2018 and 2019

Source: calculated by the authors according to the European Commission database (n.d.); State Statistics Service of Ukraine (2019).

Statistical information provided by the State Institution "Ukrainian Institute of Intellectual Property" allows us to analyze the development of inventive activities. Due to the specifics of maintaining statistics on patent and inventive activities, technical areas that indirectly relate to environmental innovations in the agricultural sector, namely "Food chemistry" and "Ecotechnologies", were chosen for analysis. Patent activity

in technical areas indirectly related to the agricultural sector is characterized by instability. The reduction is particularly noticeable for the indicator of registration of utility models in the technical direction "Food Chemistry" (Table 3, Chart 5).

In 2020, Ukrpatent, with the support of the Ministry of Economy, held the "Invention of the Year" Contest in 12 industry categories that correspond to the most relevant areas of innovation activity. The event has identified the most promising inventions of recent years and built an effective system of links between international and national investors, industry and business.

Table 3. Dynamics of inventive activity indicators in Ukraine in technical areas that indirectly relate to the agricultural sector

Scientific direction	2016	2017	2018	2019	2020
Applications for inventions					
Food chemistry	109	110	125	100	48
Ecotechnologies	53	60	41	41	30
Patents for inventions					
Food chemistry	91	95	92	90	58
Ecotechnologies	38	30	28	32	16
Utility model registrations					
Food chemistry	535	573	549	573	387
Ecotechnologies	152	190	153	186	143

Source: State Enterprise Ukrainian Institute of Intellectual Property (2021).

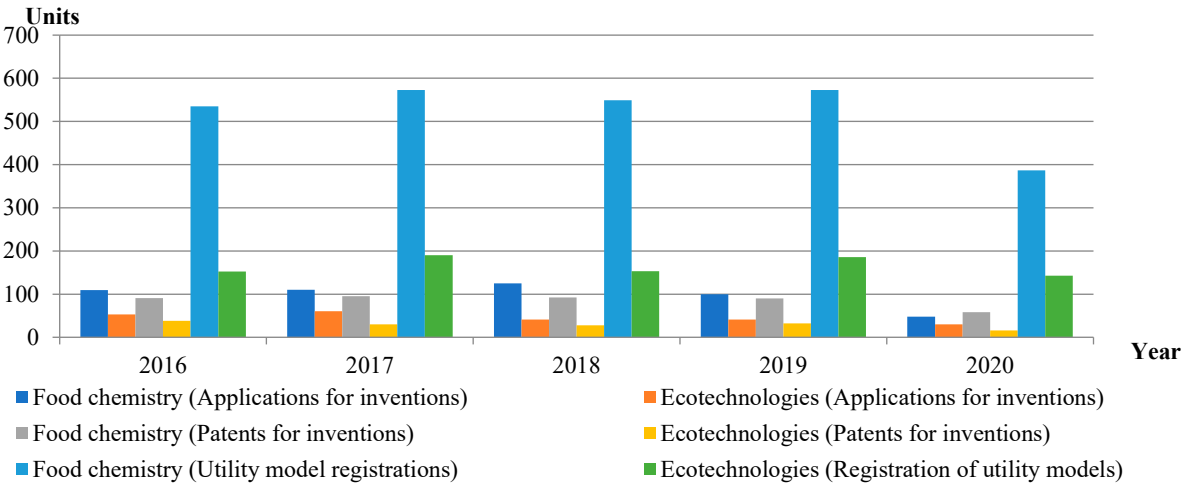

Chart 5. Indicators of inventive activity in Ukraine in technical areas that indirectly relate to the agricultural sector

Source: State Enterprise Ukrainian Institute of Intellectual Property (2021).

Characteristics of scientific activity of enterprises of agro-industrial complex of Ukraine

According to the statistical collection "Scientific and Innovative Activities of Ukraine" in 2019, the number of organizations in the agricultural sector that carried out the research decreased significantly (7 against 15 units in 2018) and the number of employees involved in the research implementation decreased (106 against 332 people for the same period).

According to the State Register of Innovative Projects (The Ministry of Education and Science of Ukraine n.d.), which is formed on the basis of the Ministry of Education and Science of Ukraine, in 2013 only 6 agricultural projects out of 18 innovative projects were registered. Project executors are private enterprises, and the vast majority are limited liability companies (hereinafter referred to as – the LLC).

All 6 projects related to technological innovation in the categories of the Organization for Economic Cooperation and Development are innovation processes and product innovation.

It should be noted that only one of the above-mentioned projects can be attributed to innovations that are clearly ecological in nature. In the future, it is logical to consider the system of state financial assistance to enterprises that are performers of innovative projects.

According to the Order of the Ministry of Economic Development and Trade of Ukraine "Some issues of organization of activities in the field of intellectual property" No. 387 dated 22 March 2018, the institutions included in the state system of legal protection of intellectual property are the following: State Enterprise "Ukrainian Institute of Intellectual Property"; State Organization "Ukrainian Agency for Copyright and Related Rights"; State Innovative Financial and Credit Institution (hereinafter referred to as – the SIFCI); State Organization "National Office of Intellectual Property".

The SIFCI was created to provide financial support for the innovative activities of business entities of various forms of ownership, as well as attract domestic and foreign investment for the development of the real sector of the economy.

The SIFCI holds competitions for innovative projects on an ongoing basis. The form of project financing is an interest-free loan on a repayable basis for up to 36 months, and the amount of financing under one project is up to 25.0 million UAH.

According to the minutes of meetings of the Competition Committee for the selection of projects for their financing at the expense of the SIFCI funds, three of the four projects presented in Chart 4 received financial and credit assistance. However, scientif-

ic and technical expertise does not cover the ecological significance of the evaluated projects.

A good example is the Environmental and Social Policy of the European Bank for Reconstruction and Development (hereinafter referred to as – the EBRD) with the strategic goal to support projects that bring significant environmental and social benefits.

Quantitative assessment of scientific activity of Ukrainian enterprises is carried out by the ratio of total R & D costs in high-tech and medium-high-tech industrial sectors to total R & D costs in industry.

$$S_{h.t.} = \frac{\sum_{i=1}^{n} S_{h.t.i}}{S_{ind.}} \times 100 \quad (1)$$

where:

$S_{h.t.}$ – unit costs for R & D in the high-tech and medium-high-tech industrial sectors, in %;

$S_{h.t.i}$ – expenses of the "i" sector, which is classified as high-tech or medium-high-tech sectors;

$S_{ind.}$ – total R & D costs in industry.

According to the scientific and analytical report "Innovation activity in Ukraine in 2019" of the Ukrainian Institute of Scientific and Technical Expertise and Information, agriculture, hunting and provision of related services, forestry, logging and fisheries belong to the low-tech sector. But the Methodology of bringing the mechanism of analytical and statistical observation of the state of innovative development of the economy in line with the standards of the Organization for Economic Cooperation and Development and the EU has lost its relevance since certain statistical observations are either not carried out or are confidential.

An equally important issue is the activation of the innovation process. The motivational mechanism of innovation implementation is aimed at stimulating demand in the primary innovation market, that is, demand for novelty carriers (information, patents, licenses, know-how, etc.) from the production sector (Table 4, Chart 6).

The peak of investment occurs in 2010 and 2019, while in other years there is a gradual decrease in investment. This means that investment and patent activity is unstable, and there is no trend towards sustainable growth.

It should be noted that the volume of capital investment in the primary innovation market does not depend on the size of enterprises.

Table 4. Capital investments of enterprises in concessions, patents, licenses, trademarks and similar rights in the agricultural, forestry and fisheries sector divided into large, medium, small and microenterprises in 2010–2019 (thousand UAH)

Year	Large enterprises	Medium enterprises	Small enterprises	Microenterprises
2010	–	1,718	20,430	6
2011	–	6,350	162	146
2012	–	13,640	1,083	29
2013	145	7,770	2,778	143
2014	1116	8,087	194	18
2015	1562	2,278	165	15
2016	2	2,115	350	88
2017	110	1,528	1,836	7549
2018	331	3,650	791	626
2019	436	39,976	844	80

Source: State Statistics Service of Ukraine (n.d.), *Capital investment by type of economic activity*.

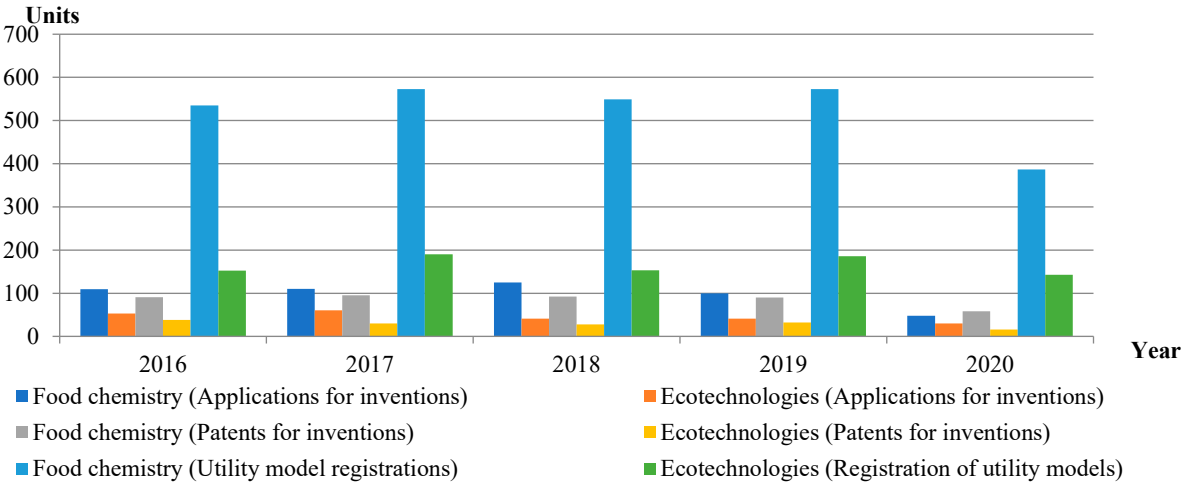

Chart 6. Investments of enterprises in concessions, patents, licenses, trademarks and similar rights in the agricultural, forestry and fisheries sector in 2010–2019

Source: State Statistics Service of Ukraine (n.d.), *Capital investment by type of economic activity*.

The overall indicator for all enterprises in the agriculture, forestry and fisheries sector is consistently low and does not exceed 0.07 %, while the percentage of enterprises' investment in concessions, patents, licenses, trademarks and similar rights to capital investments for all types of economic activity, in this period, ranged from 8% to 17% (Chart 7).

In the period from 2013 to 2019, the most patent-active enterprises are medium-sized enterprises. In 2017, microenterprises contributed almost 70% of the total investment in concessions, patents, licenses, trademarks and similar rights in the agricultural, forestry and fisheries sectors. Large enterprises are characterized mainly by a low contribution to patent investments, with the exception of 2015, when this Chart was almost 39 % (Chart 8).

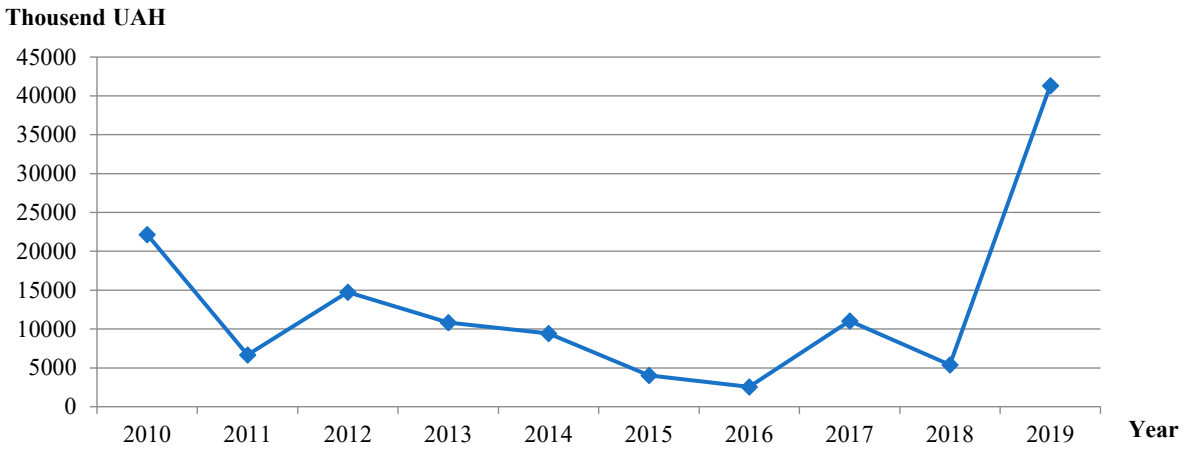

Chart 7. Percentage of enterprises' investments in concessions, patents, licenses, trademarks and similar rights to capital investments in the agricultural, forestry and fisheries sectors

Source: calculated by the authors for: State Statistics Service of Ukraine (n.d.), *Capital investments of enterprises...*

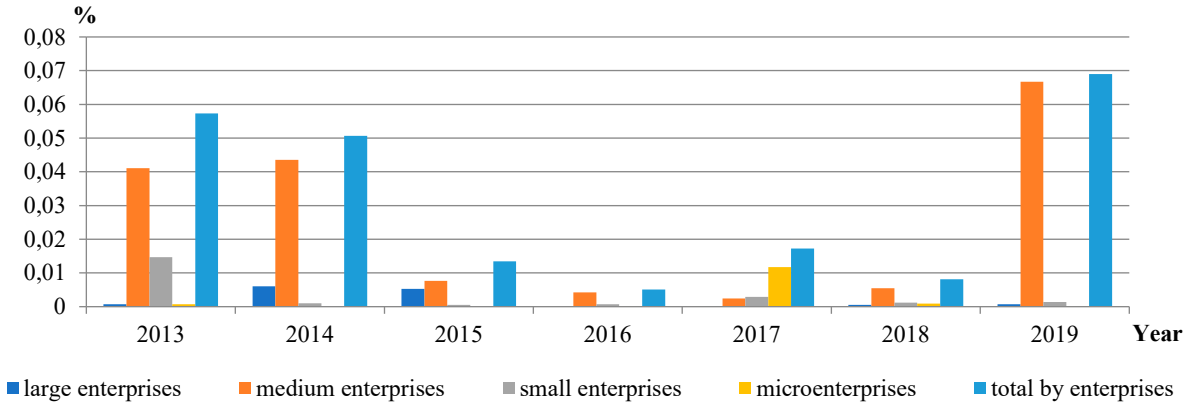

Chart 8. Contribution of enterprises of various sizes to investments in concessions, patents, licenses, trademarks and similar rights in the agricultural, forestry and fisheries sectors

Source: calculated by the authors for: State Statistics Service of Ukraine (n.d.), *Capital investments of enterprises...*

It is most appropriate to determine the coefficient of knowledge intensity of production, which can be defined as the ratio of the cost of science (innovation) to the total amount of production costs (Hariv 2003).

This ratio can be adapted to determine the scientific capacity of the production sector that is by the formula:

$$S = E_I/E_C, \quad (2)$$

where:
S – the sector's knowledge intensity coefficient;
E_I – innovation expenditure;
E_C – capital investment.

Since the state statistical observation "Innovative activity of enterprises" considers only data on enterprises with an average number of employees of 10 people or more, the subsequent calculation uses capital investments of large, medium and small enterprises, not considering microenterprises which include organizations with an average number of employees that is up to 10 people (*Defining the category of enterprises…* n.d.). The source of information was the state statistical observation "Innovative activity of enterprises".

The calculation used data for the following industrial sectors: food production, textile production, leather and related products production. Based on the calculation results, it can be concluded that the "Food production" sector is characterized by the highest knowledge intensity with an indicator of 11.28 % (Table 5).

Table 5. The level of knowledge intensity of industrial sectors related to the processing link of the agro-industrial complex of Ukraine

	Code of NACE, Rev.2	E_I	E_C	S
Manufacturing	C	11,002,539.6	105,091,812.0	10.47
Manufacture of food products	10	2,869,776.0	25,452,029	11.28
Textile industry	13	47,285.9	827,895	5.71
Manufacture of leather and related products	15	3,613.5	274,264	1.30

Sources: State Statistics Service of Ukraine (n.d.), *Capital investment by type of economic activity*; State Statistics Service of Ukraine (2019).

When assessing the level of innovation activity of an enterprise, it is important to analyze the provision of a rational ratio between own and acquired developments (Hariv 2003). The ratio coefficient is calculated as the ratio of the total number of own developments to the number of purchased ones. It can be adapted to determine the level of innovative independence of the sector:

$$R = A/T, \quad (3)$$

where:
R – the coefficient of innovation independence of the sector;
A – acquisition of new technologies;
T – transfer of new technologies.

The assessment of the level of independence is supposed to be carried out on a scale that reflects three levels of activity: low (< 1), medium (close to 1) and high (> 1), which indicates a low, balanced and high level of innovative independence, respectively.

More than a third of the number of implementations of new advanced technological processes is accounted for by new or significantly improved low-waste and resource-saving technologies, that is, environmentally significant ones. In 2018, this indicator for the production of food, beverages and tobacco products was more than 43%.

The State Statistics Service calculates and distributes statistical data on the innovation activity of enterprises on the basis of the state statistical observation "Innovation Activity of Enterprises", the methodology of which considers the provisions of the Regulation of the EU Commission No. 995/2012 dated 26 October 2012 on the production and development of statistics on science and technology. Currently, the Regulation of the EU Commission No. 995/2012 is not valid, it is canceled by the Regulation (EU) No. 2020/1197 dated 30 July 2020. No new provisions on innovation statistics have been developed, and in accordance with current planning, a proposal for an implementation act on innovation statistics should have been developed by November 2021 (Herzog 2020). Discussion and adoption of the act should be expected in May–July 2022.

The result of the study is the identification of the main strengths and weaknesses of innovation activity in the agricultural sector of Ukraine, which are presented in Table 6. As can be seen from the Chart, the mechanism for developing innovative projects in Ukraine is quite stable, while the mechanism for implementing innovative developments has more weaknesses than strengths.

Table 6. Strengths and weaknesses of innovation activity in the agricultural sector of Ukraine

Strengths	Weaknesses
MECHANISM FOR DEVELOPING INNOVATIVE PROJECTS	
High level of provision of the Ukrainian education system training of personnel for the needs of the agro-industrial complex	Unstable patent activity in technical areas indirectly related to the agricultural sector

Strengths	Weaknesses
The ratio of agricultural research costs to total research costs in comparison with other countries of the world is quite high	Visually low activity of enterprises in innovation activities due to the low level of registration of innovative projects in the State Register
There is a system of relations between inventors and international and national investors, industry, and business	The environmental aspects of innovative projects are not sufficiently considered when evaluating them State innovative financial and credit institution
There is a system of state financial assistance to performers of innovative projects registered in the State Register	A fairly low level of research and development costs
MECHANISM FOR IMPLEMENTING INNOVATIVE DEVELOPMENTS	
More than a third of the new technological processes introduced into food production are classified as new or significantly improved, low-waste, resource-saving, i.e. environmentally significant	Outdated methodology of analytical and statistical observation of the state of innovative development of the economy
A fairly high level of knowledge intensity of the food production sector	Lack of statistical data on innovative activities of enterprises in the agricultural, forestry and fisheries sectors
	Unstable level of investment by enterprises in concessions, patents, licenses, trademarks and similar rights in the agricultural, forestry and fisheries sectors
	Lack of a system of state financial assistance to innovatively active enterprises that introduce innovations in the agricultural sector
	Lack of innovative independence of the food production sector

Source: created by the authors.

Conclusions

1. Ukraine is an agrarian state, a high share of exports of which is accounted for by the products of the agro-industrial complex, so for further stable development of the country, high scientific and innovative activity of this sector of the economy is necessary, and as a result: ensuring sustainable innovation activity is one of the priorities of the state policy of Ukraine.
2. Ukraine has a high human and scientific potential to meet the needs of the agro-industrial complex. It also occupies high positions in the world ranking in comparison with other countries of the world (according to European statistics) in terms of higher education applicants who study in higher educational institutions at agro-industrial complex training programms.

3. Ukraine is characterized by a significant contribution of agricultural science to the results of the country's scientific activities, but at the same time the level of costs for performing research works is quite low.

4. Both inventive activities in technical areas indirectly related to the agricultural sector and patent and investment activities in the agricultural, forestry and fisheries sectors are characterized by instability and the growth trend in recent years can not be traced. The solution may be to strengthen the relationship between the State Enterprise "Ukrainian Institute of Intellectual Property" and the State Innovative Financial and Credit Institution.

5. Some of the weaknesses of the mechanism for implementing innovative developments are related to statistical and methodological support. Since neither EU statistics nor state Ukrainian statistics include the agriculture section in their own statistical research methods. At the moment, it is possible to analyze the mechanism of implementation of innovative developments of only one link of the agro-industrial complex, namely processing. Therefore, it is necessary to include the section A (agriculture, forestry and fisheries) in the state statistical observation of innovative activities of enterprises. It should be noted that the largest share of enterprises in the agricultural, forestry and fisheries sector falls on microenterprises, which also do not appear in the statistical observation, which in any case will distort the analysis of innovative activities of enterprises when using statistics, so it is necessary to expand the statistical observation to microenterprises.

6. In Ukraine, there is no close cooperation between institutions that are part of the state system of legal protection of intellectual property, which would contribute to increasing the level of innovation activity of both enterprises and the country as a whole.

7. The analysis of the strengths and weaknesses of the innovative activity of the agricultural sector of Ukraine shows that both the mechanism for developing innovative projects and the mechanism for implementing innovative developments require structural changes to adapt this process and achieve strategic sustainability in the context of the sustainable development paradigm. The disadvantage of the mechanism for developing innovative projects is insufficient consideration of environmental aspects during their assessment of the SIFCI. Therefore, it is advisable to expand the methodology of scientific and technical expertise with a criterion that will be responsible for quantifying environmental and social benefits at all stages of the project life cycle, based on the environmental and social policy of the European Bank for Reconstruction and Development.

8. Since Ukraine is both a developer of innovations and a user of innovations, state financial assistance should extend in both directions. First of all, assistance should be provided to enterprises that introduce low-waste and resource-saving innovations.

The main criterion, in this case, should be a quantitative assessment of the environmental and social benefits of implemented innovations. Such a system of state assistance will increase the interest of enterprises in introducing innovations, especially of an environmental nature.

9. The above-mentioned adaptation processes will not only allow us to assess the state of the existing mechanism for implementing innovative developments, but also make it possible to develop a sound strategy for innovative development of the sector.

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Ukraiński sektor rolno-spożywczy w kontekście globalnych wzorców rozwoju innowacji środowiskowych

W artykule rozważono i przeanalizowano strukturę procesu wprowadzania innowacyjnych technologii w sektorze rolniczym, pozycję konkurencyjną Ukrainy w światowych rankingach rozwoju nauk rolniczych oraz szkolenia kadr na potrzeby kompleksu rolno-przemysłowego. Zbadano naukową i patentowo-inwestycyjną działalność przedsiębiorstw kompleksu rolno-przemysłowego Ukrainy. Przeanalizowano metodologię dostosowania mechanizmu analitycznej i statystycznej obserwacji stanu innowacyjnego rozwoju gospodarczego do standardów Organizacji Współpracy Gospodarczej i Rozwoju oraz UE. Zidentyfikowano główne mocne i słabe strony działalności innowacyjnej sektora rolnego Ukrainy. W wyniku przeprowadzonych badań autorzy proponują zmiany adaptacyjne w procesie wdrażania innowacji środowiskowych w racjonalnym wykorzystaniu zasobów naturalnych w sektorze rolnym.

Słowa kluczowe: kompleks rolno-przemysłowy, innowacyjność, statystyka, zrównoważony rozwój, wydatki