DOI: https://doi.org/10.12958/1817-3772-2024-4(78)-33-38

UDC 339.137.22:330.341.1:004

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FEATURES OF REGULATION OF INNOVATIVE DEVELOPMENT OF THE AGRICULTURAL SECTOR OF THE ECONOMY OF UKRAINE

Introduction. The agricultural sector of the Ukrainian economy, as an important strategic sector, combines the production, processing and sale of agricultural products, providing the country's population with food, and has significant export potential. Ukraine has significant areas of fertile land, which is the basis for the development of the agricultural sector of the economy. Chernozems, which occupy a significant part of the country's territory, are among the most fertile in the world. The development of livestock farming is represented by the breeding of cattle, pigs, poultry and other species of animals. Livestock products meet the needs of the population in meat, milk and other products. The crop sector specializes in growing grain crops (wheat, corn, barley), oilseeds (sunflower, rapeseed), industrial crops (sugar beet, flax), potatoes and vegetables. Ukraine is one of the world leaders in the export of grain and oilseeds. The agricultural sector also includes processing enterprises engaged in the production of food products, such as bakery products, dairy products, meat products, oil, sugar and others. The agricultural sector provides the country's population with necessary food products, contributing to strengthening food security and traditionally has a significant volume of exports of grain, oilseeds and other types of products.

The efficiency of the agricultural sector largely depends on weather conditions, which can lead to fluctuations in yield and production, and therefore, in order to ensure competitiveness, the agricultural sector needs to form a favorable investment climate to receive investments in the modernization of production, the introduction of new technologies and the development of infrastructure. significant investments for. Despite existing problems and current challenges, the agricultural sector of Ukraine has significant potential for further development and growth. Provided with effective management, attracting investments and implementing innovations, it can become an even more important factor in the country's economic development and the formation of food security in Ukraine.

Analysis of recent research and publications. Many scientists have paid attention to the study of the features of the formation of the foundations of sustainable development of the agrarian sector of the economy of Ukraine. In particular, the features of the transformation of logistical connections and the economic efficiency of grain production enterprises were identified (Vasylina O., Popadynets N., Yakhno T., Sadura O., Kravchik Yu., 2024), the mechanism of the influence of agricultural cooperation on the development of human capital in rural areas of Ukraine was outlined (Demchenko O., 2024), the mechanisms of budgetary and extra-budgetary investment were identified (Dragan I., Datsiy N., Antonova L., 2024), the criteria for the attractiveness of the organic products market of Ukraine were identified (Levchenko I., Sharyy G., Andriyash A., 2024).

The purpose of the study to identify the specific features of the regulation of innovative development of the agricultural sector of the Ukrainian economy.

Presentation of the main material of the study. The agrarian sector of the economy of Ukraine has significant potential for development and ensuring the country's food security. However, to achieve this goal, it is necessary to ensure its competitiveness in endogenous and exogenous markets.

Among the methods that can contribute to increasing the competitiveness of the agricultural sector of Ukraine, it is advisable to single out the introduction of modern technologies, including precision manufacturing. Precision farming, as one of the modern approaches to farming, is based on the use of advanced technologies to obtain detailed information about the state of the soil, crops and other parameters. This approach allows you to optimize the use of resources, increase productivity and reduce the negative impact on the environment.

One of the basic modern technologies used in precision farming is GPS navigation. The introduction of GPS navigation allows you to accurately determine the location of agricultural machinery in the field, which ensures the accurate implementation of technological operations, such as sowing, soil cultivation, application of fertilizers and plant protection products.

The use of unmanned aerial vehicles to obtain high-resolution aerial photographs allows you to create detailed field maps, assess the condition of crops, identify problem areas and quickly make decisions about soil cultivation and fertilizer application.

To collect data on the condition of soil, plants and other parameters, modern sensors are used - electronic devices consisting of three main components: a sensor sensitive to changes in the physical parameters of the element, which converts them into an electrical signal; a processor that digitizes this signal; an interface that transmits this data to the device using this sensor. There are different types of sensors that can measure soil moisture, nutrient content, temperature, light and other parameters.

Data management systems allow you to collect, process and analyze data obtained from various sources, such as drones, GPS navigation, sensors and others. These systems help make informed decisions about village management agricultural production.

Among the advantages of precision agriculture, it is advisable to highlight the use of drones, GPS navigation, sensors and other technologies (Table 1),

Table 1

Advantages of precision agriculture

№	Direction	Characteristics
1	***Increasing yield***	By optimizing the use of resources and accurately performing technological operations, precision farming allows you to increase the yield of agricultural crops
2	***Reducing costs***	Precision farming allows you to reduce costs for fertilizers, plant protection products, water and other resources by using them more efficiently
3	***Reducing the negative impact on the environment***	By reducing the use of chemicals and using resources more efficiently, precision farming helps reduce the negative impact on the environment, including by forming a waste management system (Karbovska, 2024).
4	***Improving product quality***	Precision farming allows you to obtain higher quality agricultural products by providing optimal conditions for plant growth and development

The use of drones, GPS navigation, sensors and other technologies allows:

– to obtain detailed information about the condition of the soil, crops and other parameters, which allows optimizing the use of resources and increasing yields;

– to reduce costs;

– to reduce the negative impact on the environment;

– to improve product quality.

In Ukraine, precision agriculture is at the stage of active development. More and more business entities are beginning to use modern technologies to increase the efficiency of their production.

However, for the widespread implementation of precision agriculture, it is necessary to solve a number of problems, such as:

– high cost of equipment;

– continuous need for personnel training;

– infrastructure development.

Precision agriculture has great potential for development in Ukraine. By using modern technologies, Ukrainian business entities can increase their competitiveness in endogenous and exogenous markets, ensure the country's food security, and reduce the negative impact on the environment. Automation and robotics are key factors in increasing the competitiveness of the agricultural sector.

Digitalization of automation processes in the agricultural sector of the Ukrainian economy is a key factor in increasing the efficiency, productivity, and competitiveness of the industry.

It covers a wide range of technologies and tools that can be applied at different stages of management and the production cycle – from sowing to harvesting and its sale.

The use of modern technologies allows you to optimize production processes, reduce costs, and increase management efficiency (Table 2).

The basic areas of automation and robotics implementation in the agricultural sector of the Ukrainian economy are crop production, livestock breeding, and processing of agricultural products.

Digital platforms for farm management in the agricultural sector of the Ukrainian economy are used in:

– creating complex farm management systems that combine data from various sources and allow for effective planning, control, and analysis of all aspects of the enterprise's activities;

– using cloud technologies for data storage and processing, as well as for providing access to information from any place and device;

– implementing decision-making support systems based on data analysis and forecasts.

Internet of Things (IoT) tools in the agricultural sector are used when necessary:

Table 2

Benefits of automation and robotics in the agricultural sector

№	Direction	Characteristics
1	***Productivity improvement***	Automated systems and robots are able to perform work faster and more accurately than humans. This leads to increased production volumes and increased yields
2	***Cost reduction***	The use of robots and automated systems allows for reduced labor, material, and energy costs
3	***Improvement of product quality***	Automation ensures precise adherence to technological processes, which contributes to improved quality of agricultural products
4	***Optimization of resource use***	Automated systems allow for more efficient use of water, fertilizers, and other resources, which reduces the negative impact on the environment
5	***Improvement of working conditions***	Automation and robotics allow for reduced physical strain on workers and make their work safer and more comfortable

– installing sensors on agricultural machinery, equipment, and fields to collect data on soil condition, weather conditions, plant growth, and other parameters;

– transmitting data via the Internet for further analysis and use in decision-making;

– remote control of equipment and systems.

Among the problems and prospects of implementing automation and robotics in the agricultural sector, it is advisable to highlight:

– the high cost of equipment, taking into account which, in order to implement automated systems and robots, it is necessary to intensify investment processes;

– the need to train personnel in the maintenance of technical equipment and work with modern equipment.

– the need to develop infrastructure, in particular, access to the Internet and electricity.

Thanks to the introduction of modern technologies, Ukrainian business entities can increase their competitiveness in endogenous and exogenous markets, ensure the country's food security and reduce the negative impact on the environment.

Among the advantages of digitalization of the agricultural sector of the Ukrainian economy, it is advisable to highlight: increasing production efficiency, improving product quality, reducing negative impact on the environment, and developing rural areas (Table 3).

When implementing digital technologies, it is worth considering the challenges and digitalization of the agricultural sector of the Ukrainian economy, including the problems of cybersecurity and data protection.

Table 3

Advantages of digitalization of the agricultural sector of the Ukrainian economy

Direction	Characteristics	Description
Increasing production efficiency	***Activity Management***	Digital platforms and tools for agricultural production management, resource accounting, data analysis and decision-making can increase management efficiency and reduce risks
	Precision farming	The use of drones, GPS navigation, sensors and other technologies allows you to obtain detailed information about the condition of the soil, crops and other parameters, which allows you to optimize the use of resources and increase yields
	Automation and robotics	The use of automated systems and robots to perform various agricultural operations, such as sowing, soil cultivation, harvesting, allows you to reduce labor costs and increase production efficiency
Improving product quality	***Quality control***	The use of digital technologies allows you to control the quality of products at all stages of production, from sowing to harvesting and processing
	Traceability	Digital systems allow you to track the origin of products, which increases consumer confidence and provides the ability to identify and recall low-quality products
Reducing negative environmental impact	***Optimization of resource use***	Digital technologies allow you to use water, fertilizers and other resources more efficiently, which reduces the negative impact on the environment
	Reducing the use of pesticides	Precision farming allows you to reduce the use of pesticides due to their more precise and effective application
Developing rural areas	***Access to information and knowledge***	Digital technologies provide access to information and knowledge for business entities, which helps to improve their qualifications and work efficiency
	Infrastructure development	The development of digital infrastructure in rural areas contributes to the creation of new jobs and the development of the local economy (Dyachenko V., Dyachenko N., 2024)

Artificial intelligence has the potential to become a key factor in increasing the competitiveness of the agricultural sector of Ukraine. The application of artificial intelligence in the agricultural sector can help solve many problems faced by the industry and open up new opportunities for development.

Among the innovative methods that can contribute to increasing the competitiveness of the agricultural sector of Ukraine, it is appropriate to single out the development of organic production.

The Government of Ukraine has developed and is implementing programs to support organic production.

Among the prospects for organic production, it is appropriate to single out:

– The European Green Deal and Ukraine's desire to meet EU requirements for environmentally friendly production contribute to the development of the organic sector.

– Growing demand for organic products in the world and in Ukraine.

Organic production certification is an important tool for the development of organic agriculture in Ukraine and providing consumers with high-quality and safe products. It confirms that the production complies with the established standards of organic production, which guarantees the ecological purity of the product and its benefits for human health.

Advantages of organic production certification:

1. Increasing consumer confidence: an organic production certificate is a guarantee of product quality and safety for consumers, which helps to increase trust in the manufacturer and its products.

2. Expanding the sales market: organic products are in demand both on endogenous and exogenous markets, which opens up opportunities for manufacturers to expand the sales market and increase sales volumes.

3. Increasing profits: organic products, as a rule, have a higher price compared to conventional products, which allows manufacturers to make a higher profit.

4. Improving the manufacturer's image: organic production certification indicates a responsible attitude of the manufacturer to the environment and consumer health, which helps to improve its image.

Organic production in Ukraine is experiencing a period of active development, and expanding the range of organic products is one of the key trends in this process. The growing demand for environmentally friendly and safe food products creates favorable conditions for increasing the diversity of organic products on the market.

Despite positive trends, the expansion of the range of organic products in Ukraine faces a number of challenges, including:

Limited raw materials: the production of organic products requires a significant amount of organic raw materials, which is not always enough to meet the growing demand.

High production costs: organic production requires higher costs for compliance with standards, certification and quality control, which affects the cost of products.

Insufficient infrastructure: for storage, processing and transportation of organic products, an appropriate infrastructure is required, which is still insufficiently developed in Ukraine.

Marketing and sales: producers of organic products need to effectively promote their products on the market and find sales channels.

Today, there are various sales channels for organic products in Ukraine, among which the following can be distinguished:

1. Direct sales:

– Wholesale trade: organized specifically for the sale of organic products directly from the producer to the consumer.

– Online stores: allow you to order organic products online with home delivery or to a collection point.

– Home delivery: some producers offer a service to deliver organic products directly to consumers' homes.

– Farm sales: consumers can visit the farm and purchase organic products directly from the producer.

2. Retail chains:

– Supermarkets: many supermarkets have departments or shelves with organic products.

– Specialty stores: there are stores that specialize in selling organic products.

– Eco-stores: offer a wide range of environmentally friendly products, including organic products.

3. Wholesale:

– Organic wholesale bases: purchase organic products from producers and sell them to retailers.

– Cooperatives: associations of producers to jointly sell organic products.

4. Export:

– International fairs: participation in international organic fairs allows producers to find foreign partners and export their products.

– Direct contracts: entering into direct contracts with foreign companies for the supply of organic products.

Despite the existence of various sales channels, organic producers in Ukraine face a number of problems, including:

– the number of stores specializing in the sale of organic products is insufficient to meet the growing demand;

– organic products, as a rule, have a higher price compared to conventional ones, which may limit their availability for some consumers;

– consumers are mostly unaware of the benefits of organic products and cannot distinguish it from conventional;

– organic producers have to compete with conventional producers who offer cheaper products.

To solve these problems and develop effective sales channels for organic products, the following are necessary:

– state support and the creation of favorable conditions for opening stores specializing in the sale of organic products.

– optimization of production processes, reduction of logistics and marketing costs will reduce the price of organic products and make them more accessible to consumers.

– conducting information campaigns aimed at raising consumer awareness of the benefits of organic products.

– providing grants, subsidies and other types of support to organic producers will contribute to the development of organic production and an increase in production volumes.

The development of effective sales channels for organic products is an important factor in the success of organic production in Ukraine. Provided that existing problems are resolved and favorable conditions are created, organic products will be able to take a worthy place in the market and satisfy consumer needs for high-quality and safe food products.

The creation of effective sales channels for organic products, such as specialized stores, online stores, and farmers' markets, allows expanding the sales market and increasing producers' incomes.

Despite significant advantages, organic production in Ukraine faces a number of challenges, such as:

– high cost of certification;

– insufficient awareness of consumers about organic products;

– competition from unscrupulous producers.

However, organic production has great potential for development in Ukraine. With the support of the state, investors, and international partners, Ukrainian business entities can increase the production of organic products, which will contribute to the development of the agricultural sector of the country's economy and ensure food security. Obtaining organic production certificates allows confirming the quality and environmental friendliness of products, which increases its competitiveness in endogenous and exogenous markets.

Conclusions. The agricultural sector of the Ukrainian economy has significant potential for development and ensuring competitiveness in the global market. However, to achieve this goal, it is necessary to actively implement mechanisms that will increase production efficiency, product quality and reduce costs. The main areas of improvement of mechanisms for ensuring the competitiveness of the agricultural sector of the Ukrainian economy are:

– digitalization through the introduction of precision agriculture: the use of drones, satellites, sensors and other technologies to collect data on the state of the soil, crops and weather conditions, which allows optimizing fertilizer application, irrigation and other agrotechnical measures, which increases yield and reduces costs;

– automation of production through the use of robots, automated control systems and other technologies that contribute to reducing dependence on the human factor, increasing productivity and reducing the cost of production;

– the creation of electronic platforms for trade and the use of public digital marketing mechanisms create additional opportunities for producers to find new buyers, reducing sales costs and, as a result, eliminating the need to increase product prices;

Successful implementation of mechanisms to ensure the competitiveness of the agricultural sector of the Ukrainian economy is a guarantee of its sustainable development. To achieve this goal, it is necessary to combine the efforts of the state, business and scientific institutions, create favorable conditions for innovative development and ensure the efficient use of resources.

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Дяченко Н. Особливості регулювання інноваційного розвитку аграрного сектору економіки України

Досліджено особливості регулювання інноваційного розвитку аграрного сектору економіки України, серед яких: розвиток органічного виробництва, автоматизація та роботизація виробництва, упровадження сучасних технологій, таких як точне виробництво та створення електронних платформ для торгівлі. Виявлено, що штучний інтелект має вагомий потенціал стати ключовим чинником забезпечення конкурентоспроможності аграрного сектору економіки України. Ідентифіковано переваги цифровізації виробничо-управлінських процесів в аграрному секторі економіки України. Наголошено, що успішне впровадження механізмів забезпечення конкурентоспроможності аграрного сектору економіки України є запорукою його сталого розвитку. Для досягнення цієї мети необхідно об'єднати зусилля держави, бізнесу та наукових установ, створити сприятливі умови для інноваційного розвитку та забезпечити ефективне використання ресурсів.

Ключові слова: аграрний сектор економіки України, інноваційний розвиток, цифровізація, органічне виробництво, точне виробництво.

Diachenko N. Features of Regulation of Innovative Development of the Agricultural Sector of the Economy of Ukraine

The features of regulating the innovative development of the agricultural sector of the Ukrainian economy were investigated, including: the development of organic production, automation and robotization of production, the introduction of modern technologies, such as precision manufacturing and the creation of electronic platforms for trade. It is found that artificial intelligence has significant potential to become a key factor in ensuring the competitiveness of the agrarian sector of the economy of Ukraine. The advantages of digitalization of production and management processes in the agrarian sector of the economy of Ukraine are identified. It is emphasized that the successful implementation of mechanisms for ensuring the competitiveness of the agrarian sector of the economy of Ukraine is the key to its sustainable development. To achieve this goal, it is necessary to combine the efforts of the state, business and scientific institutions, create favorable conditions for innovative development and ensure the efficient use of resources.

Keywords: agrarian sector of the economy of Ukraine, innovative development, digitalization, organic production, precision manufacturing.

Received by the editors: 19.11.2024
Reviewed: 09.12.2024