

Main Directions of Development of the Agricultural Industry in the Conditions of Economic Modernization

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Abstract: This scientific article examines the current issues and challenges facing the modern agricultural sector in the context of economic restructuring. The study presents a comprehensive analysis of the main directions of development of the agricultural industry, including increasing productivity, innovation implementation, infrastructure and logistics development, as well as enhancing competitiveness in the global market. The authors propose practical recommendations and measures of state support aimed at stimulating the development of the agricultural sector and increasing its resilience in a changing economic environment.

Keywords: agricultural industry, development, economic modernization, productivity, efficiency, innovation, technology, infrastructure, logistics, competitiveness, agriculture, resilience, ecology.

Introduction:

In the conditions of rapid modernization of the modern economy, the agricultural industry becomes a key sector determining the stability and development of many countries. In this scientific article, we consider the modern challenges and opportunities that countries face in striving to ensure efficient and sustainable development of their agriculture.

The aim of this article is to analyze the main directions of development of the agricultural industry, explore innovative approaches and successful strategies, as well as identify factors contributing to sustainable and prosperous development of agriculture in the conditions of modern economic modernization.

By examining the experience of the Netherlands, we have reviewed principles and practices that can be applied in other countries to achieve sustainable development of the agricultural sector in the context of economic modernization.

Main part:

The agricultural complex (APC) encompasses agricultural enterprises, food processing industries, and related organizations involved in the production, processing, storage, and sale of agricultural products and food items. It includes all stages from cultivation and growth of crops to the production of consumable food items. Additionally, it comprises sectors such as supplying agricultural enterprises with materials and equipment, scientific and educational institutions engaged in developing new varieties and technologies, and logistics companies handling the transportation and distribution of agricultural products.

Economic modernization plays a pivotal role in the development of the agricultural sector by providing it with the opportunity to adapt to contemporary market demands. Implementation of new technologies and management methods enhances production efficiency, improves product quality, and optimizes costs, thereby increasing the competitiveness of agricultural producers both domestically and globally.

As a key sector of the economy, the agricultural industry plays a decisive role in ensuring food security, generating employment, and sustaining socio-economic development in many countries.

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However, the modern agricultural sector faces various challenges and issues affecting both economic and social spheres.

One of the main challenges is the lack of investments and funding in the agricultural sector. Despite government support programs, small and medium-sized agricultural enterprises often face difficulties accessing financial resources [1]. The insufficient funds for acquiring modern equipment, implementing new technologies, and training personnel reduce the productivity and competitiveness of agricultural enterprises.

A second significant challenge is the threat of climate change and environmental issues, which have a serious impact on crop yield and the quality of agricultural products. This includes excessive use of chemical fertilizers and pesticides, droughts, floods, soil degradation, and loss of biodiversity.

The third problem facing the modern agricultural sector is an inefficient management and production organization system. Many agricultural enterprises operate using outdated management methods, leading to irrational resource utilization, low productivity, and high costs.

Market instability and fluctuations in agricultural product prices pose serious challenges for the agricultural sector, making long-term planning and investment decisions difficult [2]. Price fluctuations can significantly affect the profitability of agricultural enterprises, making them more vulnerable to external shocks and the risk of losses.

Addressing these problems requires a comprehensive approach, including strengthening government support and investments in agriculture, as well as improving management systems, providing access to technologies, and enhancing staff qualifications.

In the context of economic modernization, it is necessary to identify key strategic directions for the development of the agricultural complex, including improving agricultural technologies and farming methods, developing infrastructure and logistics, improving the financial and economic support mechanism for the agricultural sector, and stimulating innovation. Let's delve deeper:

- Increasing productivity and production efficiency

One of the key methods to increase productivity is the adoption of modern technologies in agriculture. This includes automation and mechanization of production processes, using high-tech varieties of agricultural crops, implementing innovative soil treatment and plant care methods, and introducing digital solutions for farm management and agricultural process monitoring.

Significant attention is given to the development of the education and training system in agriculture. Training in modern agribusiness methods, the use of information technologies in agricultural production, and the enhancement of staff qualifications in the field of environmentally sustainable agriculture are essential for the effective operation of agricultural enterprises.

- Implementing Innovations and New Technologies:

This direction covers a wide range of sectors in the agricultural industry, from land cultivation methods to marketing and product distribution systems.

One of the main directions of innovative development in the agricultural complex is the development and implementation of modern agricultural technologies. This includes the use of drones and unmanned technologies for crop monitoring and yield assessment, precision farming using GPS and automation systems for field cultivation[3][4].

Another important aspect is the development and implementation of innovative methods for animal care and increasing livestock production. This includes creating conditions for comfortable animal husbandry, applying modern feeding methods and genetic selection, and introducing digital solutions for monitoring the health and productivity of animals [5].

The implementation of innovations extends to the processing and storage sectors of agricultural products. Here, modern packaging methods, canning, refrigeration technologies, and automation and quality monitoring systems play a key role in all stages of production.



- Infrastructure and Logistics Development

One of the main directions of infrastructure development is improving road networks and developing transportation logistics. This includes the reconstruction and construction of roads, bridges, as well as the development of rail and waterways. Improving transportation accessibility allows agricultural enterprises to more efficiently deliver their products to markets and reduce transportation costs.

To optimize the storage and processing of agricultural products, it is necessary to develop modern warehouse complexes and agricultural bases. This includes the creation of refrigerated warehouses, drying and purification plants, as well as the modernization of inventory management and monitoring systems.

The development of information technologies plays an important role in optimizing logistics processes. The use of digital platforms and inventory management systems allows agricultural enterprises to more effectively plan production, control inventory, and carry out product deliveries, thereby reducing costs and improving customer service.

- Enhancing Competitiveness in the Global Market

One of the key aspects of increasing competitiveness is improving the quality of products. This includes the adoption of modern agricultural technologies and methods, quality control throughout the production process, as well as adherence to quality and safety standards. High-quality products attract new consumers and enhance the image on the global market.

Another direction to enhance competitiveness is the development of new types of products and increasing the assortment and quality of offered goods, which contributes to expanding market opportunities and competitiveness. It also helps to reduce risks from dependence on specific types of products and market demand fluctuations.

An important aspect is also strengthening international partnerships and developing export potential. This includes active participation in international exhibitions and fairs, attracting foreign investments, and developing and implementing marketing strategies in global markets. Strengthening positions in the global market allows not only expanding the sales area but also diversifying risks.

- Improving the Financial-Economic Mechanism

Improving the financial-economic mechanism of the agricultural complex plays a key role in its development and competitiveness. To achieve this goal, it is necessary to implement measures and strategies that optimize financial flows, increase resource utilization efficiency, and ensure the financial stability of sector enterprises.

The first step is to ensure access to financial resources. This requires the development of special programs and mechanisms for financial support of agricultural enterprises, including low-interest loans, government subsidies, tax incentives, and other forms of government support.

The second important aspect is the development of financial instruments and services adapted to the specifics of the agricultural sector. This may include creating specialized financial products for agricultural enterprises, developing agricultural risk insurance systems, and expanding opportunities for attracting investments and diversifying sources of financing.

The third aspect is increasing financial literacy and management level at agricultural enterprises. This includes training agricultural entrepreneurs and company executives in the basics of financial management, budget planning, accounting, and financial analysis, enabling them to make informed financial decisions and effectively manage resources.

An important factor in improving the financial mechanism is the development and implementation of state policy in the field of financial support for the agro-industrial sector. This includes creating incentives for investors, improving tax and legislative regulation, as well as promoting the development of financial markets and institutions specialized in serving agricultural enterprises.



In the modern world, where economic modernization plays a key role in the development of countries, the agro-industrial sector remains one of the most important elements of the national economy. In the face of rapid changes and innovative approaches to economic development, analyzing the experience of successful countries in agricultural development becomes an integral part of scientific research. Let's analyze the main directions of development of the agro-industrial complex using the example of the Netherlands:

Let's consider the strategies and measures aimed at the development of the agro-industrial complex:

- **Sustainable Development Strategy:** The Netherlands adheres to a strategy of sustainable agriculture, which includes the use of innovative methods and technologies to reduce harmful environmental impact, preserve biodiversity, and decrease the use of chemical fertilizers and pesticides. For example, in the Netherlands, they employ floating farm systems located in Rotterdam [6]. This farm operates on water and provides space for cattle breeding, milk production, and waste disposal, reducing the carbon footprint and optimizing land and water resource use. Such innovative projects demonstrate the Netherlands' progressive approach to sustainable agriculture.

The Netherlands leads in the development of innovative technologies for agriculture, such as smart irrigation systems and automated crop management systems, contributing to more efficient resource utilization. For example, the company "b-four agro" has developed vertical farming systems. The technologies of the company allow growing vegetables and greens inside greenhouses using LED lighting, hydroponics, and controlled climate [7].

- **Innovation Stimulus Programs:** The government of the Netherlands actively supports innovation in agriculture through various programs and financial measures aimed at research and development of new technologies, production methods, and plant breeding. An example is the "Wageningen University & Research (WUR) Fund" program, which provides grants and financial support for research and innovation in agriculture and food industry. This program collaborates with universities, research institutes, businesses, and farms to stimulate the development of new technologies, improve production methods, and create innovative products contributing to the sustainable development of agriculture and the food industry [8].

- **Financial Support:** The Netherlands' state financial support programs provide agricultural enterprises with access to loans and subsidies for business development, innovation implementation, equipment modernization, and infrastructure improvement. One example is the "Energie-efficiëntie en duurzame energie glastuinbouw" (Energy Efficiency and Sustainable Energy in Greenhouse Horticulture) program. This program offers subsidies to greenhouse farming enterprises for the implementation of energy-efficient technologies and the use of renewable energy sources [9].

- **Marketing and Logistics Development:** Support programs for marketing and logistics development contribute to improving access of agricultural products to markets, expanding export opportunities, and enhancing the competitiveness of the agricultural sector as a whole. For instance, the "Nederland Distributieland" (Netherlands Distribution Country) program focuses on developing infrastructure and logistic systems facilitating efficient transportation and distribution of agricultural products both domestically and internationally. The program aims to improve access of agricultural goods to markets, reduce delivery time and costs, and enhance the quality and preservation of products during transportation [10].

These strategies and initiatives help the Netherlands maintain its position as one of the leaders in agriculture and agribusiness while contributing to the sustainable development of this sector in the country.

2. Technological Innovations:

In the Netherlands, modern agricultural technologies and innovative production methods are widely applied, significantly influencing crop yields, resource efficiency, and environmental sustainability.



One of the key technologies is hydroponics. Thanks to their climate and innovative approach, the Netherlands has become a leader in hydroponics. Another important direction is the use of greenhouse systems with climate control, automation, and monitoring, allowing for optimal plant growth conditions year-round. This contributes to increased productivity and product quality, as well as resource savings such as water and energy. FromBoer is an example of a Dutch company specializing in innovative greenhouse systems with automation and climate control. Their technologies enable farmers to create optimal conditions for plant growth throughout the year by controlling temperature, humidity, lighting, and irrigation. This enhances productivity and product quality while conserving resources such as water and energy [11].

Modern technologies in agriculture minimize the use of pesticides and chemical fertilizers, reducing negative impacts on the environment and human health. For example, integrated pest management allows controlling pest populations without excessive use of chemical protective measures. One example of technology minimizing pesticide and fertilizer use in the Netherlands is Integrated Pest Management (IPM) systems. Many agricultural enterprises in the Netherlands successfully apply IPM principles to control insects, diseases, and weeds, minimizing the use of chemical protective measures[12].

The implementation of digital technologies and monitoring systems allows real-time analysis of soil, climatic conditions, and plant growth data, optimizing production processes and enabling more informed decisions. For example, in the Netherlands, CropX develops and implements innovative agrotechnologies based on real-time data collection and analysis of soil, climatic conditions, and plant growth [13]. Using sensors, weather stations, GPS systems, and other modern technologies, CropX collects field data and analyzes it using specialized software solutions [14]. This enables farmers to obtain detailed information about soil condition, moisture level, temperature, as well as plant growth and health.

Furthermore, modern agrotechnologies contribute to the development of sustainable agricultural models, such as agroecological systems, which combine high productivity with respect for nature and biodiversity.

Thus, innovative technologies in Dutch agriculture play a crucial role in enhancing its competitiveness, sustainability, and efficiency, ensuring the sustainable development of the industry and meeting society's needs for quality and environmentally friendly agricultural products.

3. Infrastructure and Logistics:

The railway and road infrastructure in the Netherlands is well-developed, ensuring fast and efficient delivery of agricultural products to consumers and markets[15][16]. This helps reduce transportation costs and provides access to various markets both domestically and internationally.

The ports of the Netherlands, such as Rotterdam and Amsterdam, are major global transportation hubs and play an important role in exporting agricultural products[17]. They provide opportunities for cargo handling and storage, as well as access to maritime and river routes, facilitating the development of export activities and expanding market access.

Thus, the development of agricultural infrastructure in the Netherlands plays a key role in providing access to markets, reducing transportation costs, and supporting export activities, contributing to the prosperity of the agricultural sector and the overall economy of the country.

4. Risk and Resource Management:

In the Netherlands, risk management methods in the agro-industrial complex include various instruments aimed at protecting agricultural producers from adverse weather conditions and economic losses.

One such method is crop insurance, which provides financial protection to farmers in case of losses caused by natural disasters, drought, or other adverse events. The crop insurance system in the Netherlands is well-developed and includes both government programs and private insurance



companies. One example of a private insurance company offering crop insurance in the Netherlands is "Agriver." This company specializes in agricultural risk insurance and offers a wide range of products, including crop insurance, livestock insurance, and farm insurance. Agriver works with farmers across the country, providing them with protection against losses in case of adverse events such as drought, floods, or hail [18].

Additionally, farmers in the Netherlands receive financial support from the government in the form of subsidies, loans, and favorable programs aimed at enhancing the sustainability and competitiveness of the agricultural sector. For instance, the Netherlands offer preferential loans for agricultural enterprises through various financial institutions such as ANS Bank. This fund provides financial assistance to farmers and agricultural enterprises in the form of loans [19].

Thus, risk management methods in the Netherlands' agro-industrial complex are directed towards ensuring the sustainability and prosperity of agriculture, as well as preserving natural resources and biodiversity.

5. International Trade and Export:

The Netherlands plays a significant role in the global agricultural market due to its high export potential and competitiveness of its products. They are one of the largest exporters of agricultural products in the world.

Key sectors with high demand in the global market from the Netherlands include flowers and plants, seeds and seedlings, dairy products, vegetables, fruits, and juices [20]. The Netherlands is known for its advanced agricultural technologies, making their products competitive and of high quality.

Conclusion of the analysis of the directions of the agricultural complex of the Netherlands:

The analysis of the main directions of development of the agricultural complex of the Netherlands indicates a successful combination of modern technologies, a sustainable approach to agriculture, and active participation in the global market. The Netherlands demonstrate high efficiency in utilizing innovations such as digitization and process automation, contributing to increased productivity and competitiveness.

Special attention is given to sustainable development, environmental protection, and biodiversity in the Netherlands. The application of organic farming, as well as the integration of environmentally sustainable production methods, makes the Netherlands' agro-industrial complex one of the leaders in this field.

Thanks to its developed infrastructure, efficient logistical support, and successful export development strategies, the Netherlands maintains an influential position in the global agricultural market. Their high-quality and competitive products enable the country to successfully compete and maintain its positions globally.

Thus, the main directions of development of the Netherlands' agro-industrial complex combine modern technologies, sustainable development, and international cooperation, making this country a key player in agriculture and ensuring its stable development in the conditions of economic modernization.

Conclusions:

In the light of economic modernization, agriculture becomes a key sector determining the sustainability and development of many countries. Successful development of the agro-industrial complex is strategically important for ensuring food security, creating jobs, maintaining biodiversity, and reducing negative environmental impact.

However, modern agriculture faces a number of challenges, including climate change, limited natural resources, increasing global population, and the need to provide high-quality food. To effectively address these challenges, comprehensive measures and innovative approaches are necessary.

Continuing the modernization of the agricultural sector requires integrating various strategies, such as implementing modern technologies, improving infrastructure, developing human capital, and



stimulating innovation. Additionally, ensuring access to financial resources, increasing management efficiency, and developing marketing and logistics mechanisms are necessary to expand markets.

Overall, the development of the agro-industrial complex in the context of economic modernization requires coordinated efforts from governmental bodies, the private sector, civil society organizations, and the academic community. Only through collaborative actions and innovative approaches can sustainable agricultural development be ensured, securing the well-being of future generations.

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