INTERNATIONAL EXPERIENCE IN THE INVESTIGATION OF PERI-URBAN AGRICULTURE

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Abstract. This article analyzes the experience of both developed and developing foreign countries in advancing peri-urban agriculture. It highlights practical approaches employed in nations such as the United States, the Netherlands, France, and Russia for organizing peri-urban agricultural activities, ensuring the efficient use of land resources, introducing advanced technologies, and developing logistics and market infrastructure. The study also examines the possibilities of adapting these experiences to local conditions, with proposals and recommendations aimed at ensuring economic, environmental, and social harmony between urban and rural areas. The results of the research demonstrate that the countries under review apply diverse approaches to the spatial planning of peri-urban agriculture. In particular, around the city of Samarkand, vegetable farming, horticulture, and livestock breeding are identified as priority sectors, with specialization successfully implemented through zoning. The study substantiates the necessity of assessing peri-urban agriculture as a complex system that integrates ecological, economic, and social functions.
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INTRODUCTION.

In the context of accelerating urbanization processes, the issue of the rational use of areas surrounding cities has gained increasing significance. As the demand for food products continues to grow, peri-urban agriculture is regarded as an important means of meeting this demand, maintaining ecological balance, and increasing employment. This, in turn, necessitates the scientifically grounded planning and organization of peri-urban areas.

Peri-urban agriculture represents a complex territorial system that holds not only productive but also ecological, social, and economic importance. Effective management of this system requires the identification of the scientific and theoretical foundations of its territorial organization. In densely populated areas, factors such as the rational use of agricultural land, production specialization, proximity to logistics networks and markets play a crucial role.

This study addresses the scientific and theoretical approaches to the territorial organization of peri-urban agriculture, international experiences in this domain, and the analysis of research on the territorial organization of peri-urban agriculture around the city of Samarkand. Such analyses provide a deeper understanding of the comprehensive development of peri-urban agriculture.

Methods.

The research methodology encompasses the following stages: analyzing foreign and local scientific literature as well as practical studies; applying geographical and economic analysis methods to determine the regional characteristics of peri-urban agriculture (PUA); comparing approaches to organizing and managing PUA in different countries; and conducting a practical analysis based on specific zoning and sectoral structure using the example of the peri-urban area of Samarkand. Additionally, the study employed methods such as comparative analysis, historical-geographical approach, systems analysis, zoning, specialization, and the assessment of production efficiency.

Results.

Developed countries employ distinct approaches to the territorial organization and management of peri-urban agriculture (PUA). In the United States, both urban and peri-urban agriculture have, in recent years, emerged as fields of considerable scientific and practical interest. Research conducted by Rogus and Dimitri (2013) found that small- and medium-sized farms operate in the areas surrounding almost all major cities across the country. Agricultural activities in these territories often serve to supply local food networks, maintain environmental sustainability, and preserve agricultural lands under the pressure of urbanization.

Drawing on data from the Census of Agriculture conducted by the United States Department of Agriculture (USDA), the study examined the number of farmers, the size of farms, and

the types of products produced in peri-urban areas. It was further noted that a high proportion of those engaged in agriculture near cities are enterprises producing food products and supplying them to local markets.

Peri-urban agriculture provides not only economic benefits but also ensures ecological and social sustainability. However, several challenges to its development have been identified, including high land prices, insufficient infrastructure, and limited political support [3]. Consequently, researchers highlight the importance of integrating agriculture into urban planning systems, creating policy incentives, and supporting public demand for locally produced food as key strategies.

This research underscores the potential of peri-urban agricultural lands and substantiates the need for addressing urbanization and food security issues through comprehensive approaches in the future.

Oberholtzer, Dimitri, and Pressman have also conducted in-depth research on urban and peri-urban agriculture in the United States. In 2014, they published an article entitled "Urban and Peri-Urban Agriculture in the United States: Characteristics, Challenges, and Technical Assistance Needs." The authors found that peri-urban agriculture in the U.S. often consists of relatively new farms, with operations that vary in longevity. Among the primary challenges identified were profitability, access to financing, and production costs, as well as the extent to which farmers require technical assistance.

In the member states of the European Union, where the rate of urbanization is particularly high, numerous studies have been dedicated to the territorial organization of peri-urban agriculture. Over the past decade, agricultural activities encompassing peri-urban territories have entered a new stage of development. In these countries, the primary objectives of peri-urban agriculture have shifted toward ensuring environmental and social sustainability, strengthening local food systems, fostering the green economy, and improving public health and quality of life [5].

Peri-urban areas, particularly those surrounding densely populated and industrialized centers, are increasingly viewed as favorable spaces for intensive and high-tech agriculture. This trend necessitates precise spatial planning and intersectoral cooperation. To date, various distinctive practices have been implemented in European Union member states with the aim of organizing peri-urban agriculture territorially. In most EU countries, a range of practical experiences can be cited in organizing urban and peri-urban agriculture.

For example, in the Netherlands, the agropark and agro-cluster models have been developed. The country is recognized as one of the most advanced in Europe in terms of agro-innovation systems, and applies the following approaches to the development of peri-urban agriculture:

- Concentrated production within agroparks: In Venlo and Delft, agroparks have been established where greenhouses, logistics centers, and facilities for processing biological waste operate in an integrated manner (Smeets, 2009).
- Vertical farming technologies: In Rotterdam and Amsterdam, vertical greenhouses located in city centers provide clean, local, and year-round produce.
- Water-saving systems: Water circulation is maintained in closed systems. This increases the environmental efficiency of the country's agro-clusters [12].

One of the countries in the Union with a well-developed suburban agriculture is France, where suburban areas are managed based on metropolitan strategic planning. For example, in the Paris agglomeration, to ensure the population's food security, within the framework of the "Ekopole de Marne" project, 450 hectares of land have been allocated to farmers since 2010. In addition, under the "Les Jardins Partagés" program, free gardens have been provided for socially vulnerable groups of the population. For ecological products, short supply chains are implemented through the AMAP (Association pour le Maintien d'une Agriculture Paysanne) program, enabling city residents to purchase products directly from farmers [2].

Another distinctive country of the Union is Spain, where short supply chains and agricultural ecosystems, as well as urban and suburban agriculture, are well organized. In other words, the country has developed its agriculture around cities based on the "Agricultura de proximidad" model. In the Barcelona agglomeration, which holds a special status, 3,000 hectares of land have been allocated for agriculture under the "Pla de desenvolupament agrari del parc agrari del baix llobregat" plan. In these areas, water-saving technologies have been implemented using an ecosystem-based approach [11].

In Germany, one of Europe's largest countries, special attention is paid to ecological and cooperative approaches. Suburban agriculture in the country is organized on the following principles.

Firstly, there is the Community Supported Agriculture (CSA) model, in which residents themselves cooperate directly with farmers. Around Munich, Frankfurt, and Berlin, there are dozens of CSA projects.

Secondly, based on local governance and state support, city councils allocate land for lease, provide subsidies, and support educational programs aimed at

reorganizing agriculture through innovative approaches.

Thirdly, on the basis of integration with processors, agricultural producers work directly with processors, retail chains, and school canteens [7].

One of the countries where extensive research has been conducted on the territorial organization of peri-urban agriculture is Russia. Studying peri-urban agriculture in this country, as in other nations, indicates that it is among the pressing issues. Russian scholar Z.M. Ivanova (2006), in her research, emphasizes new functions of agricultural production in the context of emerging socio-economic needs, environmental problems, and recreational demands in peri-urban areas. According to the author, agricultural enterprises located around large industrial cities specialize in producing perishable products (meat, milk, vegetables, etc.), playing an important role in meeting the daily needs of the population. In doing so, the loss of quality and increased costs associated with transporting products over long distances are taken into account. In managing peri-urban agriculture, she proposes a cooperative, horizontal, and socially adaptable approach, as opposed to the traditional vertical model. This means a management system based on equal and mutually beneficial relations between producers ensures effective and sustainable development. The author also advances the concept of agro-recreational zones, arguing that peri-urban areas can serve not only agricultural production but also recreation, wellness, and tourism functions. Such an approach allows for deeper economic, social, and environmental integration between urban and rural areas [9].

Y.A. Tropinova (2003) evaluates peri-urban agriculture (PUA) as a territory with strategic resource potential for ensuring regional food security. The author considers PUA as a complex system, where production, distribution, and consumption chains operate within an interconnected micro-regional economic model. The scholar refers to peri-urban agricultural lands as "peri-urban food zones," noting that their formation is linked to external factors (urban demand, proximity to markets), internal factors (resource potential, specialization), and integrational factors (economic ties between urban and rural areas). Functionally, peri-urban food zones are interpreted as important areas providing direct exchange of food and services with cities, and according to their specialization, these territories are divided into the following functional rings:

The first ring — *dairy farming, vegetable growing, poultry, and greenhouse products.*

The second ring — *pedigree livestock breeding, seed production, and perennial crops.*

The third ring — *livestock fattening and the formation of a fodder base.*

According to Tropinova, suburban food zones, with their relatively independent production and distribution capacities, play an important role in meeting the urgent food needs of urban populations. Therefore, it is necessary to establish and manage suburban food zones as a distinct component of the regional agro-industrial complex. This would ensure not only economic efficiency but also social stability and ecological balance [10].

Another Russian scholar, Y.A. Dmitrenko (2006), identifies the agricultural infrastructure surrounding cities as a key factor in ensuring food security. According to him, the production of intensive and perishable products in agro-industrial zones located near cities is the primary means of ensuring stability in urban food supply. Dmitrenko describes the "suburban agro-industrial complex infrastructure" as a sophisticated system that encompasses not only production, but also logistics, financial services, information systems, and the legal environment. Particular attention is given to the issues of delivering products to consumers quickly and at low cost, stabilizing market prices, and efficiently allocating existing infrastructure resources.

To ensure transparency and efficiency, it is emphasized that close links must be established between urban and agricultural systems, with functional coordination between local government bodies and state institutions. Additionally, the infrastructure capacity for ensuring the timely delivery of suburban agro-industrial complex (SAAC) products to the market, reducing transaction costs, and managing product flows has been thoroughly analyzed [1].

Dmitrenko cites the example of agricultural lands located around the city of Omsk, covering an area of 14.7 thousand km² and encompassing 92 different agricultural enterprises and 1,209 farms. This area mainly supplies Omsk with meat, dairy, and vegetable products, although in certain categories (e.g., milk — 40%, meat — 70%), full self-sufficiency has not been achieved. This once again underscores the importance of infrastructural reforms, the development of the logistics system, and the expansion of production capacity [4].

DISCUSSION.

Studies show that peri-urban agriculture (PUA) is emerging, under the current processes of urbanization, not only as a food production system but also as a strategic space ensuring economic, environmental, and social integration between urban and rural areas.

International experience, particularly from countries such as the USA, the Netherlands, France, Germany, and Spain, demonstrates that innovative approaches — including agro-clusters, agro-parks, vertical greenhouses, short supply chains, and horticulture — enable PUA to operate with high efficiency. These approaches play a key role in efficient resource use, protection of land under urbanization pressure, and ensuring food security.

Overall, foreign practices prove that PUA can be developed through functional zoning, sectoral specialization, local logistics systems, and management mechanisms. In particular, around the city of Samarkand, the consideration of zoning, agro-climatic resources, geographic proximity in the placement of production sectors, and access to markets serves as evidence of the practical value of scientifically grounded approaches.

CONCLUSION.

The conducted analysis shows that in developed countries, the organization of suburban agriculture is primarily based on a comprehensive approach, the widespread implementation of innovative technologies, and the development of market infrastructure. International experience plays an important role in strengthening economic, ecological, and social ties between urban and rural areas, ensuring food security, and increasing employment.

Suburban agriculture is emerging as a complex territorial system of strategic importance against the backdrop of modern urbanization and socio-economic changes. The foreign and local practices studied in this research highlight the need for a comprehensive approach to ensure the sustainable development of suburban agriculture. In particular, preserving ecological stability, ensuring food security, organizing direct supply of products to the population, and supporting local economic activity have become key priorities.

Adapting these experiences to the conditions of Samarkand city can make it possible to develop agriculture in suburban areas, supply the domestic market with high-quality and safe food products, increase export potential, and create a balanced model of regional development. Thus, the approaches developed on the basis of foreign experience can serve as a reliable scientific and practical foundation for further improving the national agricultural policy.

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