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IMPROVING THE CLUSTER SYSTEM IN THE FRUIT AND VEGETABLE SECTOR: ORGANIZATIONAL AND ECONOMIC DIRECTIONS

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Abstract. This article analyzes the organizational and economic directions for improving the cluster system in the fruit and vegetable sector. Based on global and national experience, the study examines the features of formation and development of fruit and vegetable clusters and assesses their impact on economic efficiency, food security, and export potential. Using data from 2019–2024, key challenges in the operation of existing clusters are identified, and an improved cluster structure is proposed, focusing on the expanded use of digital technologies, the introduction of innovative financing mechanisms, the strengthening of sustainable development principles, and the integration of research activities. The proposed approach aims to expand the value-added chain and enhance the competitiveness of the fruit and vegetable sector.

Keywords: fruit and vegetable sector, agro-clusters, cluster system improvement, organizational and economic mechanisms, value-added chain, food security, export potential, competitiveness.

Аннотация: В данной статье проанализированы организационно-экономические направления совершенствования кластерной системы в плодоовощном секторе. На основе мирового и национального опыта рассмотрены особенности формирования и развития плодоовощных кластеров, а также оценено их влияние на экономическую эффективность, продовольственную безопасность и экспортный потенциал. В ходе исследования на основе данных за 2019–2024 годы выявлены ключевые проблемы в деятельности действующих кластеров и предложена усовершенствованная структура кластера, ориентированная на расширение использования цифровых технологий, внедрение инновационных механизмов финансирования, усиление принципов устойчивого развития и интеграцию научно-исследовательской деятельности. Предлагаемый подход направлен на расширение цепочки добавленной стоимости и повышение конкурентоспособности плодоовощного сектора.

Ключевые слова: плодоовощной сектор, агрокластеры, совершенствование кластерной системы, организационно-экономические механизмы, цепочка добавленной стоимости, продовольственная безопасность, экспортный потенциал, конкурентоспособность.

INTRODUCTION. Population growth and increasing competition in the global food market necessitate the institutional and economic modernization of agricultural sectors, particularly fruit and vegetable production. In this context, ensuring food security, increasing

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production efficiency, and expanding export-oriented production are among the most pressing challenges.

In this regard, the President of our country, Sh. Mirziyoyev, at a videoconference meeting held on November 5, 2019, dedicated to further developing the fruit and vegetable sector, increasing exports, and ensuring the efficient use of household plots, emphasized the need "to establish several large export-oriented clusters in Uzbekistan, create value-added chains in agriculture and increase incomes, and link producers with entrepreneurs who operate with clearly defined markets and reliable financial sources"[1]

From this perspective, the development of the fruit and vegetable sector in our country is being supported at the level of state policy, and the cluster system is being introduced as one of the key mechanisms for forming value-added chains in this field. However, in practice, a number of organizational, technological, and financial challenges continue to limit the efficiency of existing clusters. Therefore, this article examines the scientific and practical aspects of improving the cluster system.

METHODS. In the course of the research, the current state of fruit and vegetable clusters was assessed using the methods of analysis and synthesis; global and national cluster models were compared through comparative analysis; the interrelated elements of the cluster structure were identified using a systems approach; and regulatory and legal documents as well as sectoral studies were examined through the analysis of scientific sources.

ANALYSIS AND RESULTS. The analysis shows that in global practice, clusters have been established as an effective tool for integrating agriculture with market mechanisms. In Uzbekistan, fruit and vegetable clusters began to develop rapidly from 2016–2018 and served to integrate production, processing, storage, and export processes into a single system.

During 2019–2024, the introduction of the cluster system in the fruit and vegetable sector was implemented at an accelerated pace across the country. In particular, a total of 136 fruit and vegetable clusters were established in 77 districts, covering 168.4 thousand hectares of land. Of this area, 32.9 thousand hectares are directly owned by clusters, while 135.4 thousand hectares are covered through contractual cooperation with farming enterprises. As a result, cluster-based production was introduced on 44 percent of the total fruit and vegetable cultivation area nationwide[2]. This indicator confirms that the cluster model has been widely implemented as an institutional mechanism in agricultural production and has taken a leading position in the sector.

The analysis shows that within clusters, infrastructure facilities serving the formation of value-added chains have been developed to a significant extent. In particular, clusters currently include[3]:

- processing enterprises with a capacity of 659 thousand tons (26.3% of total national capacity);
- refrigerated and conventional storage facilities with a capacity of 230 thousand tons (16.7%);
- sorting and packaging lines with a capacity of 200 thousand tons (11%);
- drying facilities with a capacity of 182 thousand tons (18%);
- 105 hectares of modern greenhouses.

[1] Xalq So'zi Newspaper, November 6, 2019, Issue No. 229.
[2] Data of the Statistics Committee of the Republic of Uzbekistan.
[3] Data of the Ministry of Agriculture of the Republic of Uzbekistan.

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These indicators demonstrate that the cluster system is not limited to primary production alone but also creates opportunities for processing, storage, and supplying products to the market in a ready-to-sell form.

During 2019–2024, a total of 38 investment projects with an overall value of 765 billion UZS and a combined capacity of 185 thousand tons were implemented within the framework of clusters. In addition, 12.1 thousand hectares of intensive orchards and 9.7 thousand hectares of intensive vineyards were established.

As a result of these processes, 10.6 thousand new jobs were created, expanding income sources for the rural population. This clearly demonstrates the socio-economic effectiveness of the cluster system.

The analysis of the collected data indicates that the cluster system in the fruit and vegetable sector ensures the following key economic outcomes**:**

First, production efficiency is increasing. Cooperation among cluster participants reduces production costs, while the introduction of advanced agrotechnologies contributes to higher yields and improved product quality.

Second, opportunities for value addition are expanding. Through processing, packaging, and branding, products become more export-oriented, enabling their sale at higher prices in international markets.

Third, economic stability is being ensured. Growth in farmers' and producers' incomes, increased tax revenues, and the creation of new jobs strengthen regional economic stability.

Fourth, competitiveness is increasing. The cluster system ensures production that meets international standards, facilitating access to new export markets.

Fifth, logistics and transportation costs are being reduced. Cluster infrastructure enables the rapid, cost-effective, and low-loss delivery of products to markets.

Sixth, the adoption of scientific and innovative solutions is expanding. The practical application of research results enhances the efficiency of production processes.

Seventh, contributions to sustainable development are being made. The introduction of resource-saving and environmentally friendly technologies ensures the rational use of land and water resources.

During the research process, the following problems were identified in the operation of existing clusters:

- limited use of digital technologies;
- insufficient implementation of sustainable development and resource-saving mechanisms;
- weak cooperation with research and educational institutions;
- marketing and packaging strategies mainly oriented toward the domestic market;
- underdeveloped systems of innovative financing and risk management.

PROPOSED OUTCOMES

To improve the cluster system in the fruit and vegetable sector, the following recommendations are proposed:

1. **Institutional strengthening of cluster governance.** To enhance management efficiency in fruit and vegetable clusters, it is proposed to introduce a unified institutional governance model that clearly defines the rights and obligations of cluster participants (farmers, processors, logistics and export entities). This will reduce conflicts among participants and ensure alignment of interests.

2. **Deep integration of research and innovation into cluster activities.** It is necessary to strengthen the participation of research institutions within clusters and to establish

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mechanisms for the direct application of practical innovations in agrotechnology's, breeding, seed production, and digital solutions into production. This will ensure the long-term competitiveness of clusters.

3. **Improving cluster management through digital technologies.** It is proposed to introduce a unified digital platform in fruit and vegetable clusters for land, water, and yield monitoring, logistics and warehouse management, as well as contracts and financial settlements. This will increase transparency and reduce production costs.
4. **Wider implementation of innovative financing mechanisms.** Beyond traditional lending, clusters should actively adopt risk-mitigating financial instruments such as venture financing, leasing, agricultural insurance, and public–private partnerships.
5. **Deepening processing and value-added chains.** Expanding the share of deep processing (drying, freezing, concentrates, organic products) within clusters will broaden value-added chains and increase the range of export-oriented products.
6. **Development of export-oriented marketing and branding systems.** For fruit and vegetable clusters, it is proposed to enhance export competitiveness by developing unified national or regional brands, packaging compliant with international standards, and marketing strategies tailored to foreign markets.
7. **Introduction of sustainable development and resource-saving mechanisms.** Systematic implementation of water-saving technologies, renewable energy sources, and environmental standards within cluster activities is essential to ensure environmental sustainability and economic efficiency.
8. **Capacity building of farmers and human capital development.** Organizing continuous training courses, practical workshops, and international experience exchanges for farmers and specialists within clusters will contribute to human capital development.
9. **Introduction of performance evaluation indicators for cluster activities.** It is proposed to develop and implement a comprehensive monitoring system that includes economic, social, and environmental indicators to assess cluster performance.
10. **Strengthening cooperation and integration among clusters.** Enhancing cooperation among fruit and vegetable clusters in terms of product specialization, logistics, and export routes, as well as developing shared infrastructure and market access mechanisms, is considered appropriate.

DISCUSSION. In the experience of developed countries (the European Union, the United States, and Japan), fruit and vegetable clusters have primarily been formed on the basis of innovation and research-driven models. In these countries, strong linkages among farms, processing enterprises, and research institutions enable clusters to achieve high productivity, resource efficiency, and improved product quality. In Uzbekistan, however, clusters were initially focused on establishing production and processing infrastructure, while research and innovation components have not yet been sufficiently systematized.

In developing countries, including Turkey, Chile, and Morocco, clusters play an important role in organizing export-oriented production. Through clusters, logistics, packaging, and branding systems have been developed, enabling products to enter international markets with higher added value. In Uzbekistan as well, the significant growth of processing, sorting, and storage capacities within clusters during 2019–2024 indicates the formation of positive trends in this direction. However, compared with global practices, the level of marketing and international branding remains insufficient.

Moreover, in global practice, the contribution of clusters to sustainable development is of particular importance. In European countries, environmental standards and water- and

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energy-saving technologies are integral components of cluster activities. In Uzbekistan, measures in this area are still at an initial stage, and the need to fully integrate sustainable development principles into the cluster system remains.

The results of the comparative analysis show that fruit and vegetable clusters in Uzbekistan are gradually approaching global practices in terms of territorial coverage and production capacity. However, to ensure the long-term effectiveness of clusters, it is necessary to strengthen research and development, digital technologies, innovative financing, and international marketing mechanisms.

In this sense, compared with global practices, Uzbekistan's experience is characterized by a transition from the stage of institutional formation to the stage of innovation-driven development. This requires the development of scientifically grounded approaches to further improve fruit and vegetable clusters.

In conclusion, improving the cluster system in the fruit and vegetable sector is of great importance for ensuring food security, increasing export potential, and strengthening the competitiveness of agriculture. The proposed improved cluster model will contribute to digitalization of the sector, resource efficiency, and innovation-based development.

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