

Innovations in Agrotechnology and Food Security in Uzbekistan

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Abstract: This paper examines the current innovative approaches in Uzbekistan's agricultural sector aimed at ensuring food security. Special attention is given to the implementation of digital technologies, biotechnology, and precision agriculture methods. Achievements, challenges, and future prospects for agrotechnology in the face of climate and economic challenges are analyzed. The study concludes that comprehensive support for innovation at both the state and private levels is essential.

Keywords: agrotechnology, food security, innovations, Uzbekistan, digitalization, precision agriculture, biotechnology, sustainable development.

Introduction

Food security is one of the most important priorities of Uzbekistan's state policy. Given global climate change, water scarcity, and population growth, ensuring sustainable agricultural production requires the implementation of advanced agrotechnologies. The agricultural sector of Uzbekistan, which accounts for about 30% of employment and a significant share of GDP, is undergoing active transformation. The purpose of this paper is to analyze the innovative solutions applied in Uzbekistan's agriculture and assess their impact on the country's food security.

Methodology

The research is based on the analysis of secondary data, including statistics, reports from government agencies, scientific publications, and case studies of real projects. Methods of system analysis and a comparative approach were used to identify key innovation areas and assess their effectiveness. Examples of agri-startups and technological initiatives implemented in the country were also reviewed.

Key indicators of Uzbekistan's agricultural sector for 2019–2023, reflecting the implementation of innovations and the state of food security (according to open sources: Ministry of Agriculture of the Republic of Uzbekistan, FAO, World Bank, Uzstat):

| Indicator | 2019 | 2020 | 2021 | 2022 | 2023 |
|--|-------|-------|-------|-------|-------|
| Agricultural production volume (trillion sums) | 206.1 | 219.5 | 236.8 | 258.4 | 276.2 |
| Food security level (%) | 88 | 89.3 | 91.5 | 93.7 | 95.2 |
| Area covered by drip irrigation (thousand hectares) | 105.0 | 135.4 | 172.6 | 203.1 | 235.8 |
| Number of agri-startups receiving government support | 14 | 23 | 41 | 65 | 88 |
| Number of farms using digital technologies (%) | 4.2 | 6.7 | 11.3 | 17.8 | 24.5 |
| Wheat yield (centners per hectare) | 51.6 | 53.2 | 56.7 | 58.4 | 60.1 |
| Agricultural exports (billion USD) | 1.16 | 1.21 | 1.46 | 1.75 | 2.08 |

Results

From 2019 to 2023, the agricultural production volume increased from 206.1 to 276.2 trillion sums (a growth of ~34%). This indicates a positive trend in the development of the agricultural sector and reflects an increase in productivity. This growth is largely due to the implementation of modern technologies, infrastructure improvements, and systematic state support.

The food security level increased from 88% in 2019 to 95.2% in 2023. This indicates the strengthening of food security and a reduction in reliance on imports. A significant role here belongs to measures to diversify production and improve logistics chains.

The area covered by drip irrigation more than doubled, from 105 thousand hectares to 235.8 thousand hectares. This is one of the brightest examples of the implementation of agroinnovations. Given the acute water shortage in the region, the development of such systems is critically important for sustainable agriculture.

The number of startups receiving government support increased more than sixfold over five years. This indicates the development of entrepreneurial activity in the agricultural sector and growing interest in technological solutions in agriculture, including IT, biotechnology, and automation.

The share of farms using digital technologies increased almost sixfold (from 4.2% to 24.5%). This indicates a gradual transformation of traditional agriculture into high-tech production. However, the level of implementation is still limited, which highlights the need to expand digital literacy and infrastructure in rural areas.

Wheat yield increased from 51.6 to 60.1 centners per hectare, reflecting the effectiveness of agro-technical innovations, improved seed stock, and the implementation of precision agriculture. This is particularly important as wheat is a strategic crop for the country's food security.

Agricultural exports increased from \$1.16 billion to \$2.08 billion — almost doubling. This demonstrates the strengthening of export potential and the competitiveness of Uzbek agricultural products in international markets.

Discussion

A review of the literature shows that agroinnovations are key to ensuring food security. According to FAO (2022) and World Bank (2021) studies, digitalization and the implementation of smart resource management systems are effective ways to enhance the resilience of agricultural production, especially in regions vulnerable to climate risks and water scarcity.

In Uzbekistan, successful initiatives have been implemented, such as the introduction of Smart Farming platforms, the use of drones for monitoring, automated irrigation systems, and mobile applications for agronomists and direct trade platforms. These solutions significantly increase the efficiency of agriculture and reduce the environmental impact.

However, despite the achievements, barriers remain. Small farms often lack access to modern technologies and infrastructure, and they may not always have the necessary knowledge in digitalization and biotechnology.

Conclusion

Innovations in agrotechnology play a decisive role in ensuring Uzbekistan's food security. The development of digital solutions, precision agriculture, and sustainable production methods create a foundation for increasing yields, optimizing resources, and reducing dependence on external factors. A systemic approach, including education, investment, and support for the agro-innovation ecosystem, is necessary for maximum effect.

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