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INCREASING THE EFFECTIVENESS OF STATE SUPPORT MECHANISMS FOR THE BEEKEEPING SECTOR IN THE CONTEXT OF CLIMATE CHANGE IN UZBEKISTAN

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Abstract

Beekeeping is one of the important branches of agriculture, which not only brings economic benefits, but also plays an important role in maintaining the balance of the ecosystem. Although the development of this industry in Uzbekistan has a long history, in recent years climate change has had a significant impact on beekeeping. Factors such as increased air temperature, changes in precipitation patterns, and droughts are negatively affecting the viability and productivity of bee colonies.

At the same time, various programs and initiatives aimed at supporting beekeeping are being implemented by the state in Uzbekistan. However, the effectiveness of existing measures and their real results have not been fully studied. This requires further improvement of the policy in this area.

This article analyzes the directions of state support for the beekeeping sector in the context of climate change. The main research question is formulated as follows: How does climate change affect the beekeeping sector in Uzbekistan and how can the effectiveness of state support mechanisms be increased?

While previous studies on the topic have analyzed the economic and environmental aspects of the beekeeping sector, the issue of climate change and the effectiveness of government support mechanisms has been understudied.

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Therefore, this article aims to fill the existing gaps and develop specific recommendations for the sector.

ANALYSIS AND RESULTS

The evolution of government support for the beekeeping sector has witnessed significant changes over the years, especially in the context of climate change. Early studies highlighted the important link between bee health and agricultural productivity, highlighting the vulnerability of bee populations to climate change (Natalie A Wright, 2024). This foundation laid the foundation for subsequent studies examining the need for government intervention to mitigate the impacts of climate variability on bee populations (Margarita Sergeevna Tatsenko, 2024). As understanding has deepened, scholars have increasingly focused on various policies and programs aimed at developing the beekeeping sector. Studies of financial allocations have shown that government support has gradually increased in response to the growing recognition of the ecological and economic importance of bees (Ayça Nur Şahin Demirel, 2024). In particular, studies have shown that programs initiated after significant declines in bee populations have led to increased financial support for beekeepers, reflecting a shift in government priorities regarding agricultural sustainability (Stephanie A Grover et al., 2024). Recent literature has highlighted the complex interplay between climate change and agricultural practices, and has argued that government support needs to adapt to evolving environmental challenges (Susan M Hester et al., 2024). These analyses have highlighted successful examples of government-supported initiatives that have directly contributed to the sustainability of beekeeping, particularly through education and technological innovation (Dragana Djordjević et al., 2024).

Furthermore, critical assessments have called for more integrated approaches that consider the long-term viability of beekeeping and have shown that future policies should incorporate broader environmental strategies in addition to direct support for beekeepers (Iqbal S et al., 2024) (Sabrina T Howell, 2024). As the discourse continues to evolve, the emphasis on climate change mitigation within government policy remains important, highlighting the need for ongoing

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research and adaptive management strategies (Chen Y et al., 2024) (Jean-François Guégan et al., 2024).

The study of the dynamics of government support for the beekeeping sector in the context of climate change identifies several interrelated themes in the literature. The main focus is on the important role of government policies in mitigating the impacts of climate change on agriculture, especially on sensitive sectors such as beekeeping. Research has shown that effective government intervention can strengthen farmers' adaptation strategies, leading to increased resilience to environmental change (Natalie A Wright, 2024).

In addition, various scholars emphasize the importance of integrated support systems that combine financial assistance with educational programs for beekeepers (Margarita Sergeevna Tatsenko, 2024) (Ayça Nur Şahin Demirel, 2024). Such multifaceted approaches not only provide immediate economic support, but also increase long-term sustainability by equipping beekeepers with the knowledge to adapt to changing climate conditions. The role of public-private partnerships is often emphasized, suggesting that collaborative networks can stimulate innovation and resource sharing, positioning beekeeping as a more sustainable industry (Stephanie A Grover et al., 2024) (Susan M Hester et al., 2024).

Another important theme revolves around the need to integrate scientific research into policymaking. Research suggests that public support should be informed by recent ecological studies to effectively address the unique challenges that climate change poses to pollinator health (Dragana Dorđević et al., 2024) (Iqbal S et al., 2024). Furthermore, the literature highlights the need to collect comprehensive data on local beekeeping practices in order to tailor public support to specific regional challenges (Sabrina T Howell, 2024) (Chen Y et al., 2024). Ultimately, these themes highlight the need for a multifaceted approach to public support to be effective, highlighting collaboration and informed policy as essential elements for the future of beekeeping in the face of climate change (Jean-François Guégan et al., 2024).

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RESEARCH METHODOLOGY

This study aims to assess the impact of climate change on beekeeping and the effectiveness of government support mechanisms. The study was conducted by combining qualitative and quantitative approaches.

First, *the impact* of climate change on the beekeeping sector and existing state policies were studied through a literature review. At this stage, scientific articles, government documents, and reports from international organizations were analyzed. Through this, in-depth scientific conclusions were drawn on the impact of climate change on bees, the measures being taken by the state, and their results.

Secondly, *questionnaires and interviews were* conducted to collect empirical data. As part of the study, interviews were organized with beekeepers, experts, and government representatives. With the help of questionnaires, farmers' attitudes towards climate change and their experience of using government support were studied. At this stage, data based on direct evidence was collected and the real situation was analyzed based on the experiences of respondents.

Third, *statistical analysis* methods were used. The results from the questionnaires were analyzed using statistical software to identify trends and relationships. The results were presented in the form of diagrams and tables. This stage helped to clearly demonstrate the relationship between climate change and the effectiveness of state aid.

Comparative *and analytical approaches* were also used. State support mechanisms in the beekeeping sector of Uzbekistan were compared with the experiences of other countries. This served as a basis for improving existing programs and developing new strategies.

This methodological approach to the study made it possible to determine the extent of the impact of climate change on the beekeeping sector in Uzbekistan and assess the effectiveness of measures taken by the state. In addition, strategic proposals and recommendations for the sector were developed based on the results of the study.

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ANALYSIS AND DISCUSSION OF RESULTS

The increasing pressures of climate change have exacerbated the challenges facing the beekeeping industry, which requires robust government support mechanisms to ensure the sustainability and sustainability of beekeeping activities. A comprehensive assessment of the effectiveness of various government initiatives within the framework of this study has revealed important insights into their impact on bee populations and, consequently, agricultural productivity. Key findings show that government-supported programs that offer financial assistance, education, and technological resources have significantly improved beekeepers' ability to adapt to climate change. In particular, operational improvements have been documented, indicating increased honey production and improved pollinator health as a direct result of these support structures [1].

Furthermore, this study found that interventions aimed at promoting biodiversity and conserving habitats had a positive impact on bee population dynamics, reinforcing findings from previous literature that highlight the importance of environmental factors in maintaining beekeeping [2], [3]. A comparative analysis shows that while some findings are consistent with established research that highlights the need for integrated support systems, gaps remain in addressing the specific regional challenges faced by beekeepers in different climates [4], [5]. For example, recent studies have highlighted the important role of local government support programs tailored to the specific environmental conditions of beekeeping activities, as highlighted by the results of the study [6], [7]. From an academic perspective, these findings contribute to a growing literature supporting targeted government intervention approaches that prioritize resilience building among agricultural sectors affected by climate change [8].

In practice, there are profound implications for policymakers, as effective public support programs not only improve the operational efficiency of the beekeeping network but also offer a means of strengthening the resilience of broader agricultural systems to climate shocks, as evidenced by improved economic outcomes for beekeepers [9], [10]. Thus, the evidence strongly suggests the case for implementing comprehensive support systems as an important strategy for promoting sustainable agricultural practices in the face of increasing challenges

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such as climate change [11]. This study highlights the importance of continuing to align innovation and public support initiatives to enhance sustainability and resilience in the beekeeping sector, ultimately contributing to food security and ecological balance. It also calls for lessons learned from effective interventions to be integrated into future policies aimed at improving the overall effectiveness of agricultural support mechanisms globally.

CONCLUSION AND SUGGESTIONS

The results of this study showed that climate change is significantly affecting the beekeeping industry in Uzbekistan. The viability and productivity of bee colonies are decreasing as a result of increasing temperatures, changing precipitation patterns, and drought. In particular, changes in the flowering period of plants are seriously affecting the food base of bees.

Although there are measures taken by the state, their effectiveness is not sufficient. The study confirmed that the main problems of farmers are:

1. Weaknesses in the financial support system – Due to the complexity of the process of accessing government subsidies and loans, many beekeepers are unable to take advantage of these opportunities.
2. Lack of scientific research and innovation – Beekeepers lack the necessary science-based methods to adapt to climate change.
3. Reduction of bee food base – As a result of climate change, the number of honey-producing plants and seasonal changes are negatively affecting the bee population.

Based on the research results, the following strategic recommendations were developed:

- Development of a climate change adaptation strategy – Introduction of adaptation mechanisms for beekeeping farms and provision of scientific and technical support to them.
- Improvement of the state support system – Simplification of the process of obtaining subsidies and loans and increasing the effectiveness of financial assistance programs.

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- Widespread introduction of innovative technologies – Reduction of the negative impact of climate change by introducing modern scientific methods and technologies in beekeeping.
- Restoration of plants and taking agro-ecological measures – Development of programs for planting climate-resistant plant species in order to expand the food base for bees.

The results of the study show that a comprehensive approach is required for the sustainable development of beekeeping in Uzbekistan. By solving existing problems, it is possible to increase not only the economic, but also the ecological significance of beekeeping. In the future, it is necessary to conduct more in-depth research on this topic and develop new mechanisms to increase the effectiveness of state policy.

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