

## Effect of Climate Change and Recent Droughts on Quantitative and Qualitative Performance of Horticultural Crops in Badghis

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### ABSTRACT

This study aimed to investigate the impact of climate change on horticultural crops in Badghis province, Afghanistan. Data was collected through a questionnaire completed by gardeners and experts in the horticulture department. Descriptive statistics are used to analyze the data, and the results showed that climate change had a significant negative impact on the performance of horticultural crops, including decreased yield and quality and an increase (33%) in plant pests and diseases. The study highlights the need for complete and comprehensive measures to mitigate the effects of climate change and recent droughts on horticulture in Badghis province. The majority of interviewers (51%) reported a decrease in yield and quality of their crops due to changes in temperature and rainfall patterns. In addition, many interviewers reported an increase in plant pests and diseases (54%), which they attributed to climate change. The study also found that orchards in Badghis have adopted some adaptation strategies, such as changing their planting schedules and using more efficient irrigation methods. However, these strategies are not enough to fully address the challenges posed by climate change.

**Keywords:** Badgis Province, Climate changes, Drought, Horticultural Crops

### INTRODUCTION

Climate change is a major problem for agriculture and horticulture sectors. Badghis is a region in northwest Afghanistan, where the production of crops, especially grains, vegetables, and fruits, are important for the local economy and food supply. This region has experienced significant climate changes in recent years, which can affect the performance of horticultural crops in Badghis. This study examines the effects of these climate changes based on the experiences of farmers, orchards, and agricultural experts of the horticulture department, especially professors and agricultural managers. Previous research in similar areas has shown that the main effects can be an increase in temperature and a decrease in precipitation (Lobell & Field, 2007). These conditions can reduce the yield and quality of orchards products (Challinor et al., 2014). Therefore, comprehensive research in this field can help improve agricultural systems and horticulture plants in Badghis. Scientific and experimental studies have shown that climate change, including increasing temperature, decreasing rainfall, changes in wind patterns, and increasing dry and hot days, have negative effects on horticultural crops (Rehman et al., 2015). Climate changes can also change the pattern of plant pests and diseases (Glenn et al., 2013). Investigating the effects of climate change on horticultural crops can help to develop suitable adaptation and economic solutions, such as effective irrigation methods, drought-resistant varieties, new technologies, and optimization of agricultural systems. Training farmers and orchardists about optimal water use and natural resource management can also help (Malhotra, 2017).

### MATERIALS AND METHODS

**Study Area:** This study was conducted during the fall season 2023 in the center of Badghis province Qala-e-Now district.

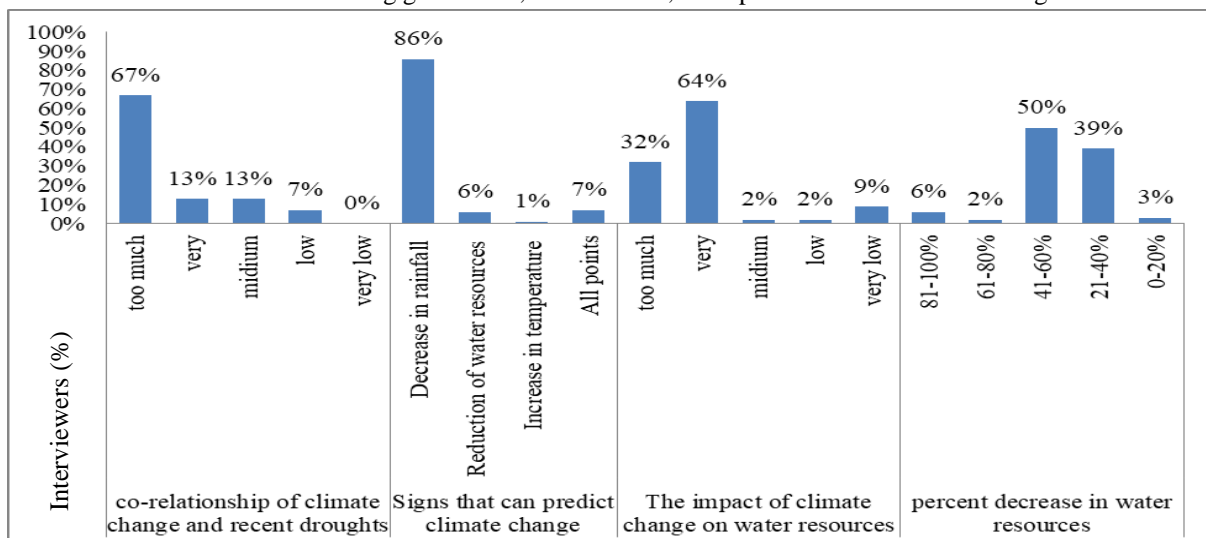
**Samples Collection:** In this research, data collected through a questionnaire consisting of 24 questions. The questionnaire designed to collect information related to the research objectives. Hundred people were participated in this study, the method of selecting the statistical population was random, and the interviewers were professors and students of the faculties of agriculture and environment, farmers and orchardists from the Center of Qala-e-Now.

**Statistical Analysis:** After completing the data collection process, the collected data were carefully organized and entered into Excel software for analysis. Descriptive statistics calculated to summarize the data. The

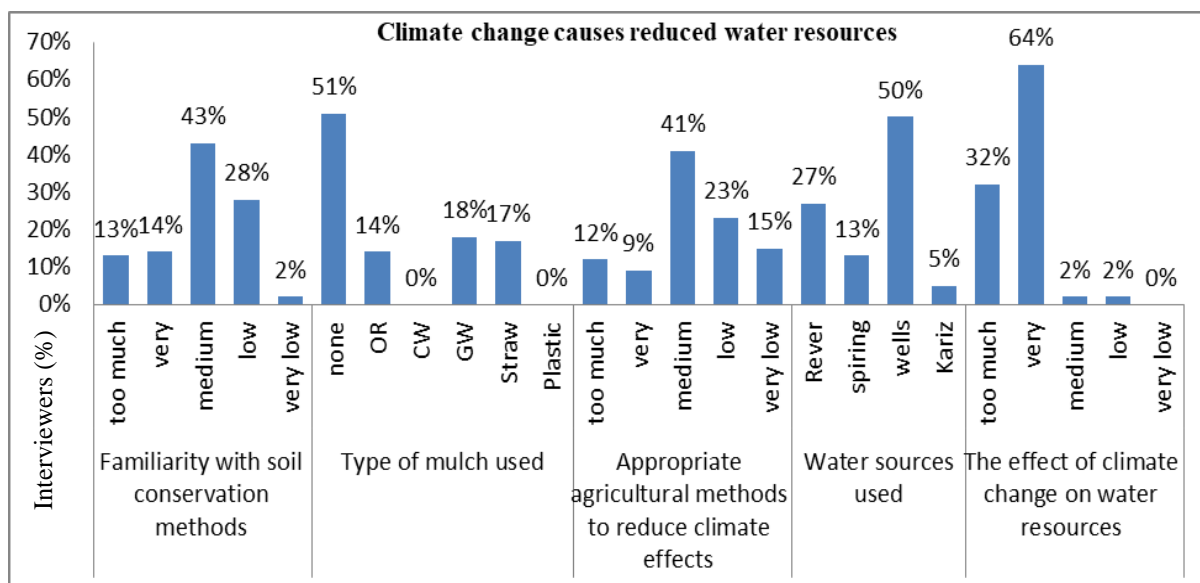
collected data were included in the research findings by presenting the results and related findings in the research results section. Graphs used to visually display the data and enhance the understanding of the findings.

## RESULTS AND DISCUSSION

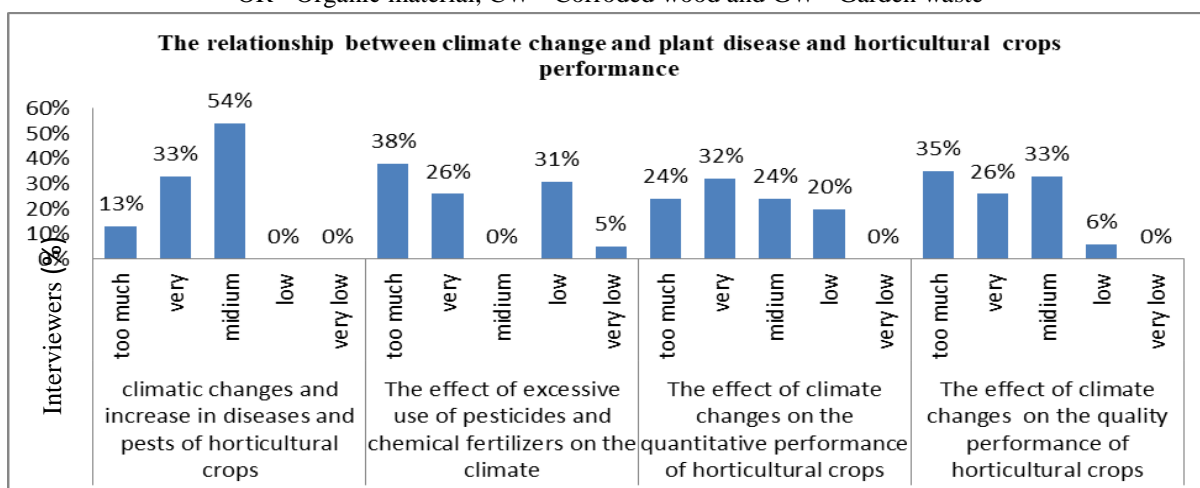
The study included participants of various ages; with the majority (60%) being young people aged 18 to 30. In terms of education, the majority of interviewers held a bachelor's degree (54%), followed by a master's degree (40%), and a 12th-grade education (6%). About 47% of the interviewers reported having 1 to 5 years of experience in horticulture sector. The research findings indicate that a significant number of horticulture experts (54%) based their observations of climate change on scientific and practical experiences. Furthermore, the majority of interviewers (67%) recognized a strong relation between climate change and droughts, considering climate change as a primary factor contributing to recent droughts. The majority (86%) identified changes they noticed as indicators of climate change. Regarding precipitation patterns, 66% of the interviewers observed changes in the timing, amount, intensity, and nature of rainfall. The study also revealed that climate change led to an increase in the frequency of storms, floods, and strong winds, resulting in damage to orchardist's crops in the region. In terms of water sources, 50% of the orchardists in Badghis province relied on wells, while 27%, 13%, and 5% used river water, springs, and Kariz, respectively. Climate change and recent droughts significantly affected water resources in the orchardists, with 50% of the orchardists reporting a reduction of 41-60% in their water supply. Additionally, 68% of the gardeners had limited knowledge of modern irrigation techniques and expressed the need for more information and experience in this area. The study highlighted that many orchardists lacked knowledge about maintaining soil moisture to optimize water consumption. More than half (51%) did not use any mulch. Planting more trees and protecting vegetation was considered the best approach to combat climate change and droughts by 41% of the interviewers. Other effective measures included preserving forests and grasslands (25%), utilizing underground water sources efficiently (11%), and preventing rainwater wastage and creating chakdame (23%). The majority of orchardists (65%) also lacked familiarity with suitable agricultural methods to deal water scarcity, such as using resistant varieties and drought-resistant stock. According to the survey, 76% of the gardeners in the province considered alternative plants (pistachio and Hing plants) that require less water and contribute to climate restoration. The study revealed a relationship between climate change and an increase in plant diseases and pests, with interviewers noting the negative effects of indiscriminate and inappropriate use of pesticides and chemical fertilizers on the climate. Climate change and recent droughts were found to have significant adverse effects on the quantity and quality of horticultural crops. These effects also impacted the interest of gardeners in establishment of new gardens. Climate change was identified as a factor contributing to soil erosion and reduced agricultural land yield, highlighting the need for additional measures such as creating green belts, reforestation, and optimal water resource management.



**Figure1.** The relationship between climate change and drought



**Figure2.** The relationship between climate change and water resources  
OR= Organic material, CW= Corroded wood and GW= Garden waste



**Figure3.** The relationship between climate change and plant disease and horticultural crops performance

## CONCLUSION

The findings of this research show that recent droughts have had adverse effects on horticultural crops, reducing their quantitative and qualitative performance (51%). Additionally, climate change has discouraged orchardists from Establishment of new orchards, further exacerbating the problem. In conclusion, this study highlights the significant impact of climate change on plant diseases, pests, and crop yields (54%). The indiscriminate use of pesticides and chemical fertilizers identified as a contributing factor to the negative effects on the climate. Furthermore, this study shows that climate change has led to soil erosion and a reduction in agricultural land yield. While some measures have been taken to mitigate these effects, such as creating green belts and reforestation, they are not enough to address the issue. The study underscores the need for policymakers to prioritize climate change adaptation strategies and consider alternative crops, such as pistachio and Ferula, that demonstrate resilience to water scarcity. Other effective measures included preserving forests and grasslands, utilizing underground water sources efficiently, preventing rainwater wastage, and creating chakdame.

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**Conflict of Interests:** All authors express no conflict of interest in any part of the research

**Author Contributions:** Orfany conceived, developed, and performed the idea and investigation presented in the article. Haqmal and Sarvary verified the analytical methods.

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