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Localization strategies for climate change adaptation in arid and semi-arid regions of Iran

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Extended Abstract

Introduction: Climate change, driven by the increase in greenhouse gas emissions, has emerged as one of the most significant environmental challenges of the 21st century. This issue is particularly pressing for arid and semi-arid regions like Iran, where agricultural systems are heavily dependent on water resources that are becoming increasingly scarce due to rising temperatures, altered precipitation patterns, and frequent droughts. Agriculture in these regions is vital for local economies and food security, making it crucial to adopt strategies that help mitigate the adverse effects of climate change. This study focuses on examining the adaptation strategies employed by farmers in Iran's dry and semi-dry regions to cope with the negative impacts of climate change. The main aim is to analyze the effectiveness of these strategies and offer recommendations for improving water resource management practices.

Methods: The research employed a descriptive-analytical methodology with a mixed approach, combining both qualitative and quantitative methods. Data were collected through fieldwork, using questionnaires and semi-structured interviews with local farmers, environmental experts, and natural resource managers. The survey targeted farmers in the arid and semi-arid regions of Iran, particularly those from the provinces of Sistan and Baluchestan, Kerman, and South Khorasan, Iran. The study gathered insights into the strategies used by farmers to adapt to climate change, such as changing crop types, employing modern irrigation systems, and diversifying agricultural practices. Statistical methods including Chi-square tests, ANOVA, and Pearson correlation were used to analyze the data and explore relationships between climate change impacts and adaptation strategies.

Results: The findings of the study revealed that farmers in arid and semi-arid regions of Iran primarily adopt two strategies to cope with climate change: changing crop types (66.7%) and utilizing modern irrigation systems (53.3%). These results highlight the emphasis on altering crop patterns to suit changing climatic conditions and the adoption of advanced irrigation technologies to conserve water. Additionally, the study identified two primary climate change impacts that affect agricultural productivity: reduced water resources and increased temperatures. A strong correlation was found between these two impacts, with a correlation coefficient of 0.85, suggesting that the decrease in water availability is closely linked to rising temperatures. The ANOVA test further indicated that the development of modern irrigation infrastructure is considered one of the most critical needs for farmers, underscoring the importance of improving water management systems.

Discussion: The results suggest that farmers in Iran's dry and semi-dry regions are actively engaging in adaptive strategies, with a clear focus on water conservation and crop diversification. The high percentage of farmers adopting modern irrigation systems reflects an increasing awareness of the need for efficient water use, particularly in areas where water scarcity is a pressing concern. The correlation between reduced water resources and higher temperatures reinforces the urgency of addressing both climate impacts simultaneously. The prioritization of modern irrigation infrastructure in farmers' responses highlights the role of technology in enhancing agricultural resilience to climate change. However, while these strategies show promise, challenges remain in terms of accessibility to advanced irrigation technologies and knowledge about drought-resistant crops. Additionally, policy support is crucial for ensuring that farmers have the resources and knowledge they need to implement these strategies effectively.

Conclusion: This study emphasizes the need for localized adaptation strategies to address the challenges posed by climate change in arid and semi-arid regions of Iran. The two primary strategies identified changing crop types and employing modern irrigation systems—are essential for ensuring agricultural sustainability in these areas. The strong correlation between reduced water resources and increased temperatures further underscores the urgency of improving water resource management. Policymakers should prioritize the development of modern irrigation infrastructure, provide training for farmers on advanced technologies, and promote the cultivation of drought-resistant crops. Furthermore, ongoing research into innovative irrigation solutions and the development of climate-resilient crop varieties should be supported. The findings of this study can serve as a valuable foundation for policymaking and resource management planning in the face of climate change, ultimately helping to improve the resilience of agricultural systems in Iran's dry and semi-arid regions.

Keywords: Climate change, Agricultural adaptation, Arid and semi-arid regions