



Original Article

ROLE OF CLIMATE-ADAPTIVE AGRICULTURAL SYSTEMS IN ENHANCING INCOME AND INCLUSIVE LIVELIHOODS OF SMALL AND MARGINAL FARMERS

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Abstract:

Climate change poses severe threats to agricultural productivity, especially among small and marginal farmers who rely heavily on rain-fed systems and traditional practices. This paper examines how climate-adaptive agricultural systems (CAAS) influence income enhancement and promotes inclusive rural livelihoods. By integrating field surveys, secondary data, and stakeholder interviews from selected regions, this study highlights mechanisms through which climate-adaptive practices contribute to economic stability and social inclusion. Findings suggest that adoption of CAAS improves income diversification, reduces vulnerability to climate shocks, and strengthens community resilience.

Keywords: *Climate Change, Agriculture, Farm Resilience, Impact on Farmers*

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Introduction:

Agriculture is a primary source of livelihood in rural areas, but it is increasingly affected by climate change through irregular rainfall, rising temperatures, and extreme weather events. These changes have intensified production

risks and income uncertainty, particularly for small and marginal farmers who depend heavily on climate-sensitive farming systems.

Small and marginal farmers play a crucial role in food production but face greater vulnerability due to limited landholdings, financial constraints,



and restricted access to modern agricultural technologies. Crop failures and unstable yields often lead to income insecurity and livelihood challenges, making sustainable income enhancement a major concern for rural development.

Climate-adaptive agricultural systems include farming practices designed to reduce climate risks and improve resilience, such as climate-resilient crops, efficient water management, crop diversification, and soil conservation. These systems not only help stabilize farmers' income but also support inclusive rural livelihoods by improving food security, employment opportunities, and overall socio-economic well-being.

Objective of the study:

1. To identify climate-adaptive agricultural practices adopted by small and marginal farmers.
2. To examine the impact of climate-adaptive agricultural systems on farmers' income.
3. To assess the role of climate-adaptive practices in promoting inclusive rural livelihoods.
4. To analyze the challenges faced by farmers in adopting climate-adaptive agricultural systems.

Methodology:

This study is based on small and marginal farmers practicing climate-adaptive agriculture. **Primary data** are collected through questionnaires and interviews, while **secondary data** come from government reports and research articles. Farmers are selected using **random sampling**, and the data are analyzed.

Impact of Climate-Adaptive Agricultural Systems on Farmers' Income:

Climate-adaptive agricultural systems help farmers earn **more stable and higher income** despite

changing weather conditions. By using drought-tolerant seeds, water-saving irrigation, and mixed cropping, farmers reduce crop failure and production costs. These practices improve yields, ensure better market supply, and create additional income sources, especially for small and marginal farmers. Overall, climate-adaptive systems protect livelihoods and increase financial security.

1. **Climate-Resilient Crops:** Growing drought-tolerant or heat-resistant varieties.
2. **Crop Diversification:** Planting multiple types of crops to reduce the risk of total crop failure.
3. **Efficient Water Management:** Using drip irrigation, rainwater harvesting, or micro-irrigation.
4. **Soil and Resource Conservation:** Practices like mulching, contour farming, and organic manure.
5. **Integrated Farming Systems:** Combining crops, livestock, and agro forestry for sustainable production.

Role of Climate-Adaptive Practices in Promoting Inclusive Rural Livelihoods:

Climate-adaptive practices help rural families earn a living even when weather conditions are uncertain. By reducing crop losses and improving productivity, these practices ensure steady income for small farmers, women, and landless workers. They create more employment opportunities, support food security, and encourage the use of local resources. As a result, climate-adaptive practices promote inclusive growth and improve the quality of life in rural areas.

Challenges Faced by Farmers in Adopting Climate-Adaptive Agricultural Systems:

- Many farmers do not have sufficient knowledge or awareness about climate-adaptive agricultural



practices. This lack of information makes them hesitant to adopt new methods and technologies.

- The high initial cost of improved seeds, modern equipment, and irrigation systems makes adoption difficult for many farmers. Small and marginal farmers often cannot afford these expenses without financial support..
- Many farmers struggle to obtain timely credit and affordable loans for adopting new agricultural practices. Delays and limited reach of government subsidies further reduce their ability to invest in climate-adaptive systems.
- Farmers often do not receive sufficient training to understand and apply climate-adaptive techniques correctly. Weak technical guidance from extension services makes it harder for them to adopt and sustain these practices.
- Farmers are unsure whether climate-adaptive practices will give reliable yields under changing weather conditions. This fear of possible crop loss makes them hesitant to adopt new farming methods
- Climate-resilient seeds, tools, and inputs are often not easily available in remote rural areas. This limited supply forces farmers to depend on traditional practices instead of adopting climate-adaptive methods.
- Farmers often lack strong connections to markets, which limits their ability to sell produce at fair prices. Uncertain and low price assurance reduces their motivation to adopt climate-adaptive farming practices.
- Small and fragmented landholdings limit the effective use of climate-adaptive farming techniques. Due to limited space and resources, farmers find it difficult to invest in and implement these practices..

Findings of the Study:

1. Most small and marginal farmers have adopted climate-adaptive agricultural practices such as drought-tolerant crops, crop diversification, and water-efficient techniques.
2. Adoption of climate-adaptive practices has helped farmers achieve more stable and higher incomes compared to those using traditional methods.
3. Climate-adaptive agriculture has contributed to inclusive rural livelihoods by improving food security, creating employment opportunities, and enhancing social well-being.
4. Farmers face challenges in adopting these practices, including limited access to finance, lack of technical knowledge, and inadequate institutional support.

Conclusion:

Climate-adaptive agricultural systems help small and marginal farmers improve their income. They reduce the risks caused by unpredictable weather and climate change. Farmers using these practices can get more stable crop yields and earn better income. These systems also support inclusive rural livelihoods by improving food security and creating more opportunities. Women and vulnerable farmers benefit when these practices are widely adopted. However, not all farmers can easily access these techniques due to lack of awareness or resources. Government support, training, and community programs are needed to encourage adoption. Overall, climate-adaptive agriculture strengthens both income and well-being in rural areas.

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