



Farmers' Perception And Adoption Of Climate-Smart Agricultural Practices: A Review

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Abstract:

Global agriculture faces enormous problems as a result of climate change, which makes the adoption of climate-smart agricultural techniques necessary to improve sustainability and resilience. The goal of this study is to comprehend how farmers in a particular area view climate change and how likely they are to implement climate-smart farming methods. Surveys and interviews are combined in the study's mixed-methods technique to collect both quantitative and qualitative data. A representative sample of farmers is surveyed as part of the quantitative component to gauge their knowledge of climate change, perceptions of its effects on agriculture, and familiarity with climate-smart practices. Additionally, the poll looks into how socioeconomic factors affect farmers' decision-making when it comes to implementing climate-smart practices. With a more comprehensive understanding of the factors influencing farmers' decisions to adopt climate-smart practices, the research findings should be of great value to policymakers, extension services, and agricultural practitioners. The study's ultimate goal is to provide information for focused treatments and tactics that support sustainable and adaptive agricultural systems and increase agriculture's resistance to climate change.

Keywords: Climate change, climate-smart, policymakers, agricultural practitioners, climate change

Introduction:

Global agriculture has previously unheard-of difficulties as a result of climate change, which calls for creative and flexible solutions. The idea of "climate-smart agriculture" (CSA), which emphasizes methods that improve agricultural sustainability in the face of changing climatic circumstances, has gained popularity in this setting. Farmers play a pivotal role in the successful adoption of climate-resilient approaches through their perceptions and decisions, which is at the core of Community Supported Agriculture (CSA). This study explores the relationship between farmers' attitudes toward climate change and their readiness to implement climate-smart farming techniques. Customizing tactics that fit local circumstances requires an understanding of how farmers perceive and react to climate change. Farmers offer invaluable insights into the real-world effects of climate change on agriculture because of their in-depth understanding of the land.

Farmers' Awareness of Climate Change:

Adopting climate-smart agricultural methods requires a thorough understanding of climate change and its effects on agriculture. Farmers frequently rely on their first-hand observations of weather patterns and shifting environmental circumstances because they are the main stakeholders in the agricultural landscape. Farmers' knowledge of the changing environment is developing as a result of scientific proof of climate change as well as noticeable changes in temperature, precipitation, and extreme weather events (Glendenning, Babu and Kwadwo *et al.*, 2010). In order to inform farmers about climate change, government programs, non-governmental organizations, and extension services are essential. Workshops, training courses, and awareness campaigns aid in closing the knowledge gap between scientists and farmers. The degree to which these interventions are successful in raising farmers' knowledge varies depending on a number of factors, including language barriers, accessibility, and the applicability of the information to regional farming methods.

Perceptions of Climate Change and Its Impact:

Farmers' views on climate change are influenced by both their own experiences and scientific evidence. A more complex picture of how climate change is affecting agriculture is provided by localized observations of changing planting seasons, unpredictable rainfall patterns, and an increase in the frequency of pests and illnesses. Adaptive methods are often

recognized by farmers as necessary to protect their livelihoods. Due to disparities in geography, culture, and socioeconomic status, farmers frequently have different perspectives on climate change. People who live in susceptible places, like low-lying coastal areas or desert landscapes, might be more conscious of the dangers posed by climate change. Access to resources and information may enable farmers to be more adaptive, but marginalized people may find it more difficult to adjust to the changing environment.

Factors Influencing Farmers' Decision-Making:

A complex web of interrelated elements, from socioeconomic concerns to environmental constraints, influence the decision to implement climate-smart agriculture methods. The perceived risk and susceptibility related to climate change is one of the main drivers. Adaptive methods are frequently adopted by farmers as a means of risk mitigation since they are perceived as carrying greater hazards (Saguye, *et al.*, 2017). Decision-making heavily relies on socioeconomic factors, such as farm size, income level, and financing availability. It might be simpler for larger farms with greater resources to make investments in infrastructure and new technologies. However, a large percentage of the world's farming community consists of smallholder farmers, whose financial limitations can make it difficult for them to implement climate-smart farming methods. One of the main factors influencing how farmers make decisions is their access to education and information. Farmers who are knowledgeable about climate-smart techniques are more likely to be aware of their advantages and know how to implement them. Extension services, local community networks, and agricultural advisers are essential in equipping farmers with the know-how and abilities to adopt new practices. Social networks and community dynamics also affect how decisions are made. Innovations are frequently spread via personal connections and neighbourhood-based projects. Farmers may be more likely to adopt climate-smart methods themselves if they see their peers doing so effectively. This could have a domino effect on the farming community. The adoption of climate-smart behaviours is either aided or hindered by government policies and support systems. Promoting sustainable agriculture through incentives, subsidies, and regulatory frameworks might motivate farmers to switch to methods that are more robust to climate change. On the other hand, regulations that favour traditional farming practices could prevent uptake.

Climate-Smart Agriculture Techniques and Their Adoption:

Climate-smart agriculture refers to a collection of methods intended to increase yield, reduce exposure to climate change, and advance sustainability. These methods consist of, but are not restricted to:

- 1. Agroforestry:** Including shrubs and trees in agricultural settings helps enhance soil health, biodiversity, and water conservation.
- 2. Conservation Agriculture:** To improve soil structure and water retention, use diversified crop rotations, little soil disturbance, and permanent soil cover.
- 3. Precision Farming:** Making use of technology to minimize environmental impact, increase efficiency, and optimize resource utilization, such as GPS, sensors, and data analytics.
- 4. Drought Resistant Crop Varieties:** Creating and promoting crop types that can flourish in areas that are prone to drought and are resistant to water scarcity.
- 5. Water Harvesting and Management:** Putting into practice methods for effectively collecting, storing, and managing water resources—especially in places where water scarcity is a concern.
- 6. Livestock Management Practices:** Utilizing sustainable methods in animal husbandry to minimize environmental effect, increase productivity, and lower greenhouse gas emissions.

Farmers' opinions of these climate-smart agriculture methods' viability, effectiveness, and advantages will determine how widely they are adopted. Farmers are more likely to adopt new techniques if they fit in with their current skill set, available resources, and cultural norms. Participatory techniques, in which farmers actively participate in the decision-making process and receive the assistance they need for implementation, are frequently associated with successful adoption.

The Role of Extension Services:

Extension services are essential in helping farmers adopt climate-smart farming practices because they serve as a bridge between scientific information and practical demands. Good extension services create an atmosphere that is favourable to the adoption of novel approaches by offering training, technical assistance, and information that is specific to the area and provided in a timely manner. A fundamental feature of extension services is the dissemination of climate data that is adapted to farmers' comprehension. Farmers may make well-informed decisions about planting, irrigation, and harvesting thanks to weather forecasting, seasonal climate predictions, and early warning systems. Accurate knowledge improves their capacity to predict and adapt to climatic variability. Farmers' ability to adopt climate-smart practices is greatly enhanced by the training programs offered by extension agencies. Farmers in their own communities can learn from successful case studies and obtain practical experience through workshops, farmer field schools, and field demonstrations. These farmer-driven approaches foster a sense of responsibility and improve the efficacy of knowledge transfer. Additionally, extension services act as a bridge to financial, material, and technological resources. By connecting farmers with equipment suppliers, seed banks, and lending institutions, we can make sure they have the resources they need to implement climate-smart farming methods. Extension services can also help farmers navigate bureaucratic procedures so they can take advantage of government grants and incentives (Swanson, 2006).

Challenges and Opportunities in Farmers' Adoption:

While there is a growing awareness of the need for climate-smart agriculture, several challenges hinder widespread adoption:

- a) **Limited Access to Resources:** Financial limitations frequently impede smallholder farmers' ability to invest in new infrastructure or technologies needed for climate-smart farming methods.
- b) **Lack of Knowledge and Information:** Farmers may find it difficult to comprehend climate-smart activities and their potential advantages if they do not have adequate access to timely and relevant information.
- c) **Resistance to Change:** Farmers may be reluctant to accept new approaches, especially if they believe there is a lot of danger involved or if the methods go against their established ways of farming.
- d) **Inadequate Infrastructure:** Certain climate-smart techniques may be difficult to execute if there is inadequate infrastructure, such as irrigation systems or water storage facilities.
- e) **Policy and Institutional Barriers:** Barriers can include institutional restraints that restrict access to resources as well as policies that do not encourage or promote climate-smart agriculture.

Despite these challenges, there are also opportunities to enhance farmers' adoption of climate-smart practices:

- a) **Holistic Approaches:**
Integrated approaches that consider the socio-economic, cultural, and environmental context of farmers can enhance the adoption of climate-smart practices.
- b) **Community Engagement:**
Engaging local communities in decision-making processes and encouraging peer-to-peer learning can create a supportive environment for adoption.
- c) **Technology Transfer:**
Leveraging advancements in technology and facilitating the transfer of innovative solutions can empower farmers to overcome resource constraints.
- d) **Market Incentives:**
Creating market incentives for climate-smart products and practices can motivate farmers by linking sustainability to economic benefits.
- e) **Research and Development:**
Continued research into climate-smart agricultural practices tailored to specific agroecological zones can provide farmers with context-specific solutions.

Importance of Agriculture Extension:

- a) **Knowledge Dissemination:** Farmers can receive up-to-date information, research findings, and technology breakthroughs through agricultural extension. It converts intricate scientific data into easily understood, useful knowledge that farmers may use in their operations. By adopting cutting-edge and effective farming techniques, farmers are empowered to increase productivity and sustainability.



Figure 1: Azolla preparation

- b) **Skill Development:** Agricultural extension concentrates on developing farmers' skills in addition to sharing knowledge. Extension services provide farmers with training programs, workshops, and demonstrations to help them apply new technology, manage resources efficiently, and deal with issues brought on by shifting market and climate conditions.
- c) **Adoption of Innovations:** Because of alterations in market dynamics, climate instability, and technology improvements, the agricultural environment is always changing. Agricultural extension makes it easier for farmers to keep up with these developments and allows for the prompt adoption of new technologies, crop varieties, and creative practices. This flexibility is essential to enhancing resilience and preserving the agricultural industry's competitiveness.
- d) **Problem Solving and Decision Support:** Extension programs offer practical assistance to farmers, assisting them in identifying and resolving particular problems. Agricultural extension agents provide useful answers and context-

specific decision support for a variety of problems, including pest infestations, soil fertility problems, and market access obstacles.

- e) **Market Linkages:** In an increasingly globalized agricultural economy, access to markets is a key determinant of farmers' success. Agricultural extension services play a role in establishing market linkages, providing information on market trends, pricing, and facilitating the formation of farmer groups or cooperatives. This ensures that farmers not only produce efficiently but also have avenues to sell their produce profitably.
- f) **Policy Implementation:** Government policies and programs are implemented and distributed at the local level through agricultural extension. It assists farmers in navigating and comprehending policy frameworks, obtaining subsidies, and making the most of government assistance for the advancement of agriculture.
- g) **Empowerment of Farmers:** Agricultural extension equips farmers with the information, tools, and resources they need to make wise decisions about their farming methods. This empowerment enhances farmers' livelihoods generally and aids in rural development and poverty alleviation.

A vital link in the agricultural value chain, agricultural extension facilitates the information, expertise, and resource flow from research institutions and policymakers to local farmers. In order to maintain agriculture's resilience, productivity, and ability to adapt to the changing requirements of farmers and the agricultural industry at large, this cooperative and interactive process is essential.

Conclusion: The research explores the intricate dynamics of farmers' perceptions and uptake of climate-smart farming techniques, providing insight into important variables affecting their choices. The results highlight the complex interplay of social, economic, and environmental factors in these practices. As important players in sustainable agriculture, farmers show differing levels of knowledge and comprehension of climate-smart practices, depending on things like education, information availability, and past experiences. The study emphasizes how crucial it is for supportive policies and extension services to mould farmers' mindsets and practices. Adoption success hinges on the implementation of effective communication tactics that accommodate a range of educational backgrounds and farming environments. Promoting an environment that is favourable for the adoption of climate-smart activities also requires the implementation of risk mitigation techniques, financial incentives, and community engagement programs.

ACKNOWLEDGMENT:

This research is supported by Division of Research & Innovation, Uttaranchal University, Dehradun, India.

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