



POLICY BRIEF

February 2025

Scaling up Protected Agriculture Technology for Sustainable and Climate - Resilient Agriculture in Bhutan

Executive Summary

Protected Agriculture technology offers a promising climate-smart agriculture (CSA) solution with the potential to higher yield, produce quality crops, and strengthen resilience to climate change, thereby contributing to enhanced food security.

Protected agriculture gives year-round production in locations, climates or during seasons that are unsuitable or even hostile for production.

This weather smart technology saves crops from cold in winters, heat in summer, and rain in monsoon seasons.

Given the country's vulnerability to climate-induced challenges such as erratic monsoon rainfall, drought and fluctuations in temperature, protected agriculture can support sustainable food production while advancing both mitigation and adaptation efforts.

This policy brief outlines the benefits of protected agriculture, the challenges to its widespread adoption, and strategic recommendations for integrating this technology into Bhutan's agricultural sector.

1 Background and Context

Extreme weather events, erratic rainfall, increased temperature and increased pest and disease incidents pose significant challenges in agriculture production.

The open field production of vegetable encounter with many production constraints like heavy rain, wind- storms, excessive solar radiation, temperatures and humidity levels above plant growth optima, high insect pest infestation pressure and fungal diseases.

Protected agriculture is the sustainable approach to- ward the vegetable production under adverse climate and protection against biotic (diseases, pests, and weeds) and abiotic (temperature, humidity, light) stresses. The protected agriculture technology will help the smallholder farmers and women headed families to harvest better yields with better quality vegetables from small plot of land, while saving labor resources from frequent weeding, irrigation and other intercultural operations.



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2 Current Challenges

Despite the potential advantages, the adoption of protected agriculture faces several challenges:

High initial investment: The infrastructure required for greenhouses can be costly.

Limited technical knowledge: Many farmers lack the expertise to construct and manage greenhouse effectively.

Access to financing: There is often limited access to affordable credit or subsidies for adopting such technologies.

3 Policy Recommendations

To encourage the adoption and scaling up of protected agriculture, governments and policymakers should consider the following strategies:

i. Financial Support and Incentives

Subsidies and Grants: Offer subsidies for the purchase of greenhouse materials and equipment, targeting smallholder farmers who cannot afford the high initial costs.

Low-interest Loans: Provide affordable credit options for farmers to invest in protected agriculture infrastructures.

ii. Technical Training and Capacity Building

Extension Services: Strengthen agricultural extension services to train farmers on protected agriculture, including climate control, pest management, and irrigation systems.

iii. Infrastructure Development

Water Scarcity Solutions: Invest in water-efficient irrigation systems, particularly in regions suffering from water scarcity.

Transport and Market Access: Improve rural infrastructure to enhance access to markets for products grown in protected environments. This includes roads and cold storage.

iv. Research and Innovation

Climate-Resilient Crops: Support the development of drought- and heat-resistant crop varieties that are particularly suited for protected agriculture.

Smart Technologies: Encourage the adoption of climate-smart technologies such as sensors, automation and artificial intelligence (AI) to monitor and control growing conditions in real time, improving both productivity and sustainability.

v. Supporting farmer-based organizations, especially ones led by women and youths

vi. Supporting small-scale agro-enterprises with skills development and value addition to local products.



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4 Conclusion

Protected agriculture presents a transformative opportunity to address the challenges of food security, water scarcity, and climate change. To realize its full potential, governments must take proactive measures to reduce the barriers to adoption and create a supportive ecosystem for farmers. By investing in infra-structure, providing financial and technical support, and

promoting innovation, protected agriculture can become a key pillar of sustainable food systems in the years to come.

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Figure 1. Winter vegetable cultivation in protected structures in Sarpang Dzongkhag