



Constraints Faced by Pineapple Farmers in Adopting Climate Smart Adaptation Strategies in Kerala

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HIGHLIGHTS

- Market price fluctuations and reduced fruit weight due to adverse climate conditions were identified as the most critical constraints.
- Farmers face challenges such as inadequate labor availability, high input costs, and insufficient government support.
- Access to climate-smart technologies and agricultural subsidies needs to be improved to enhance adaptability.

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ABSTRACT

The demand for pineapples is significant in Kerala, making sustainable cultivation crucial for long-term agricultural development. Ernakulam, Kottayam, and Kollam are among the key pineapple-producing districts in the state. However, pineapple farmers in these regions face numerous challenges in adopting climate-smart adaptation strategies. This study, conducted during May 2024, aimed to identify and prioritize these constraints using data collected from 130 farmers through personal interviews. Garrett's ranking technique was employed to analyse the data. The findings revealed that market price fluctuations, often caused by reduced fruit weight due to adverse climatic conditions, were the most critical barrier. Other significant constraints included inadequate labour availability, insufficient government support, high input costs, limited agricultural subsidies, restricted access to climate-smart technologies, and inadequate credit facilities. This study emphasizes the need for improved marketing infrastructure, enhanced labour availability, stronger government support, and increased access to climate-smart technologies and financial resources. Addressing these barriers is vital to strengthening the adaptive capacity of pineapple farmers in Kerala and ensuring resilience and sustainability in the face of climate change.

INTRODUCTION

Pineapple (*Ananas comosus* L. Merr.), a tropical fruit from the Bromeliaceae family, is highly valued for its economic and nutritional significance, making it one of the most commercially important fruit crops worldwide (Baruwa, 2013). Globally, fresh pineapple accounts for 50 per cent of trade, followed by canned products (30%) and juice concentrate (20%). In Kerala, pineapple cultivation is a critical component of the agricultural economy, contributing 8 per cent to global production and spanning 10,200 hectares, with an annual yield of 85,500 tonnes. Ernakulam district

leads in production, accounting for over 60 per cent of the cultivated area (Joy, 2013). The state is renowned for its high-quality 'Mauritius Pineapple.'

Despite its resilience, pineapple cultivation in Kerala faces increasing challenges due to climate variability. Ideal growing conditions for pineapple include temperatures between 15°C and 32°C with adequate drainage. However, deviations in rainfall and temperature have led to delayed growth stages, increased costs, and reduced crop revenue (Williams et al., 2018). For instance, the severe floods in Kerala caused disease outbreaks that affected 50 per cent of the remaining crops, significantly degrading fruit quality

(Thomas & Dinesh, 2020). The sensitivity of pineapple to climate change is reflected in reduced yields, smaller fruit sizes, and altered taste and colour, which significantly lower farmers' incomes (Iwuchukwu & Udoe, 2014). According to the Food and Agriculture Organization (FAO, 2008), rising temperatures and water stress due to climate change threaten food production, often leading to crop failures. Defined as long-term changes in climate caused by natural variability or human activity (IPCC, 2001), climate change poses severe risks to sustainable development, affecting health, food security, and infrastructure.

Farmers in Kerala encounter significant constraints in implementing climate-smart practices, such as fluctuations in rainfall, rising production costs, and limited access to technology. Despite its adaptability, pineapple cultivation remains vulnerable to climate-induced disruptions. This research aims to identify the perceived constraints faced by pineapple farmers in Kerala in adopting climate-smart adaptation strategies. Addressing these challenges is essential to promote the adoption of sustainable practices and ensure the long-term productivity and resilience of pineapple farming in the region.

METHODOLOGY

The study was conducted in the districts of Ernakulam, Kottayam, and Kollam in Kerala, focusing on pineapple cultivation. Ernakulam and Kottayam were chosen for their significant pineapple cultivation areas, contributing 51.29 per cent and 28.26 per cent of the state's production, respectively, in 2021-22 (GOK, 2023). Kollam was selected due to a sharp decline in cultivation area, from 531 hectares in 2005-06 to 79 hectares in 2019-20, reflecting challenges faced by farmers, especially after the 2018 Kerala floods that impacted production and productivity (GOK, 2022). A total of 130 farmers participated in the study: 50 each from Ernakulam and Kottayam, and 30 from Kollam. The snowball sampling technique was employed, starting with initial respondents who referred additional farmers, ensuring a representative network of pineapple growers in the region. Data collection was conducted through personal interviews using a pre-tested semi-structured interview schedule. Constraints were identified based on expert input and a review of relevant literature. Garrett's ranking technique was used to prioritize the constraints (Garrett & Woodworth, 1969). The scores for each constraint were aggregated and averaged to determine the mean scores. Constraints were then ranked in descending order based on their mean scores to identify the most critical factors. This systematic approach allowed for an in-depth understanding of the constraints faced by pineapple farmers in adopting climate-smart adaptation strategies, providing actionable insights for addressing these challenges.

RESULTS

The data in Table 1 reveal that market price fluctuations, with a mean score of 67.93, were the most critical constraint faced by pineapple farmers. Adverse climatic conditions reduced fruit weight, resulting in inadequate compensation due to a lack of standardized grading systems. Pineapple growers are compelled to sell their produce at low prices during the peak season, largely due to inadequate marketing facilities. Das et al., (2014) & Das et al., (2016)

Table 1. Constraints faced by pineapple farmers in adopting climate smart adaptation

Sl.No	Constraints	Mean score	Rank
1	Market price affected by decreased fruit weight	67.93	I
2	Inadequate labour availability	58.52	II
3	Lack of government support	57.95	III
4	Lack of agricultural subsidies	55.79	IV
5	High cost of agricultural inputs needed for adaptation strategies	52.55	V
6	Lack of climate smart technologies at field level	51.65	VI
7	Inadequate credit facilities	47.54	VII
8	Lack of proper irrigation facilities	43.97	VIII
9	Lack of access to resources	34.42	IX
10	Lack of access to climate information	30.44	X

emphasized the need for improved marketing infrastructure to address these challenges, while Roy & Ghosh (2022) highlighted similar issues among pineapple growers in Tripura. Labour shortages, scoring 58.52, ranked as the second major constraint. Pineapple farming relies heavily on skilled labour for climate-smart practices like mulching and irrigation. The scarcity of labor forces farmers to either scale down operations or forego important adaptive strategies that require continuous and skilled labor. Ghazi et al., (2023) underscored the critical role of labour availability in sustaining productivity, with Kumar et al., (2021) & Shasani et al., (2020) noting similar challenges in other agricultural contexts.

Lack of government support, with a mean score of 57.95, was the third significant barrier. Farmers depend on subsidies, training, and infrastructure support to adopt climate-smart practices. The lack of such institutional support places pineapple farmers at a disadvantage, as they are unable to access the resources and incentives necessary for transitioning to climate-smart agriculture. Sharma et al., (2016) & Marie et al., (2020) highlighted the importance of institutional backing in empowering farmers to transition to adaptive strategies. The lack of agricultural subsidies (Mean score: 55.79) and high input costs (Mean score: 52.55) compounded financial constraints. Nancy et al. (2015) emphasized the burden of adaptation costs, while Chandran & Podikunju (2021) noted the high expense of implementing climate-smart technologies in Kerala's pineapple sector.

The unavailability of climate-smart technologies (Mean score: 51.65) and limited access to credit (Mean score: 47.54) were additional barriers. This discrepancy may be attributed to a gap between the technological recommendations provided by researchers and the actual adoption of these technologies by pineapple growers. This gap suggests a need for better alignment between research outputs and practical application in the field to enhance both production and productivity (Roy, 2015). Marie et al., (2020) & Talanow et al., (2020) stressed the importance of accessible financing and technology dissemination to bridge the gap between research and field application.

Inadequate irrigation facilities (Mean score: 43.97), lack of essential resources (Mean score: 34.42), and limited access to climate information (Mean score: 30.44) further constrained

adaptation. The absence of proper irrigation infrastructure limits farmers' ability to manage water resources efficiently, leading to reduced productivity and making it difficult for them to adapt to erratic weather patterns. Chandran & Podikunju (2021) highlighted water management issues in Kollam, while Talanow et al., (2020) underscored the role of timely climate information in improving decision-making.

DISCUSSION

The most critical constraint identified was market price fluctuations (Mean score: 67.93). Reduced fruit weight due to adverse climatic conditions and the absence of a grading system force farmers to accept prices determined by intermediaries based on visual inspections. This issue underscores the need for standardized grading and marketing infrastructure reforms, aligning with findings by Das et al., (2016). Without addressing price volatility, farmers remain unable to invest in adaptive practices. Labor shortages, scoring 58.52, ranked as the second major constraint. A shrinking agricultural workforce limits the adoption of labor-intensive climate-smart strategies like mulching and efficient irrigation. As noted by Ghazi et al., (2023), attracting a skilled, younger workforce is essential for sustainability. Farmers rely heavily on subsidies and training programs for adopting new techniques. The lack of government support (Mean score: 57.95) and agricultural subsidies (Mean score: 55.79), as highlighted by Sharma et al., (2016), hampers their ability to transition to sustainable practices. High input costs (Mean score: 52.55) and limited access to climate-smart technologies (Mean score: 51.65) further constrained adaptation efforts. Farmers often struggle to afford improved crop varieties and technologies, echoing findings by Nancy et al., (2015) & Baliwada et al., (2017) on the financial burden of adaptation.

Inadequate credit facilities (Mean score: 47.54) and poor irrigation infrastructure (Mean score: 43.97) compounded these challenges, restricting investments in long-term strategies. Limited access to essential resources (Mean score: 34.42) and climate information (Mean score: 30.44) hindered informed decision-making, adding to farmers' vulnerability. These interconnected constraints highlight the urgent need for reforms in market systems, labor policies, government support, and resource access to enhance the resilience of pineapple farmers against climate change.

CONCLUSION

The present study identified several constraints impeding the adoption of climate-smart strategies in pineapple farming. Addressing these challenges requires a combination of policy-level and farm-level initiatives. Efforts should focus on improving marketing infrastructure and introducing standardized grading systems to stabilize market prices. Capacity-building measures, such as training programs and awareness campaigns, are essential to attract skilled labor and enhance farm-level practices. Additionally, strengthening government support through subsidies, expanding access to credit, and promoting climate-smart technologies will empower farmers. Enhancing irrigation facilities and establishing reliable climate information systems are crucial for adaptation. A

coordinated approach involving farmers and policymakers is vital to foster resilience and sustainability in the pineapple farming sector.

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