

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 584-587

Received: 02-04-2026

Accepted: 08-05-2026

Indexed Journal

Peer Reviewed Journal

Constraints hindering farmers' adaptation strategies for reducing farm vulnerability in the Saurashtra region of Gujarat

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7h.3912>

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Abstract

Climate change has substantially increased production risks and livelihood insecurity among farm households, making adaptation strategies essential for sustaining agricultural production. However, the successful adoption of climate-resilient practices is constrained by several socio-economic, technological, institutional and market-related factors. The present study was undertaken to identify and prioritize the constraints hindering farmers' adaptation strategies in the Saurashtra region of Gujarat. Primary data were collected from 240 farm households selected from Junagadh and Jamnagar districts using a structured interview schedule. The Rank Based Quotient (RBQ) technique was employed to prioritize the perceived constraints. The analysis revealed that uncertainty regarding the performance of new technologies under changing climatic conditions (RBQ = 94.36), labour shortage coupled with increasing labour wages (RBQ = 85.27) and small operational landholdings (RBQ = 78.52) were the most severe constraints limiting adaptation. In contrast, lack of awareness regarding climate-smart technologies (RBQ = 34.77) and inadequate extension services (RBQ = 34.81) were perceived as relatively less severe constraints. The study emphasizes strengthening extension services, climate advisory systems, institutional credit, timely input delivery and market infrastructure to enhance farmers' adaptive capacity and improve resilience against climate variability.

Keywords: Climate change, adaptation strategies, constraints, rank based quotient, farm households, Gujarat

1. Introduction

Agriculture remains one of the most climate-sensitive sectors worldwide and is increasingly exposed to climatic uncertainties such as erratic rainfall, prolonged dry spells, rising temperatures and frequent extreme weather events. These changes have significantly affected agricultural productivity, farm income and livelihood security, particularly in semi-arid regions. In India, where agriculture continues to support a large proportion of the rural population, climate variability has intensified production risks and increased the vulnerability of farming communities. Adaptation has emerged as one of the most effective approaches to reducing climate-induced risks. Farmers adopt various adaptation measures including micro-irrigation, crop diversification, integrated nutrient management, integrated pest management, soil moisture conservation practices and improved crop management technologies to minimize production losses. However, despite the availability of these adaptation options, their adoption remains uneven due to several socio-economic, institutional and technological constraints.

Several empirical studies have demonstrated that farmers'

adaptation decisions are influenced by institutional support, education, access to credit, extension services and climate information. Deressa *et al.* (2009) ^[2] reported that crop diversification, irrigation, soil conservation and changing planting dates were the major adaptation measures adopted by farmers, while access to extension services, education and institutional credit significantly enhanced adaptation behaviour. Similarly, Pokiya *et al.* (2024) ^[7] observed that education, farm income, extension agency contact, government support and access to credit positively influenced the adoption of farm vulnerability adaptation strategies among cotton and groundnut growers in Gujarat. Despite the growing recognition of climate change and the increasing adoption of climate-resilient agricultural practices, empirical evidence on the constraints limiting farmers' adaptation strategies in the Saurashtra region remains limited. Identifying and prioritizing these constraints is essential for formulating location-specific interventions that enhance farmers' adaptive capacity and promote sustainable agricultural development under changing climatic conditions. The Saurashtra region of Gujarat represents one of the most climate-vulnerable agricultural regions because of its

dependence on monsoon rainfall, recurrent droughts and limited irrigation resources. Although farmers have increasingly recognized the need for adaptation, several barriers continue to hinder effective adoption. Understanding these constraints is essential for designing appropriate policies aimed at improving climate resilience.

Therefore, the present investigation was undertaken to identify and prioritize the major constraints hindering adaptation strategies among farm households in the Saurashtra region.

2. Materials and Methods

2.1 Study area

The study was conducted in the Saurashtra region of Gujarat. Based on the farm vulnerability analysis, Junagadh and Jamnagar districts were purposively selected for the primary survey.

2.2 Sampling procedure

A multistage sampling technique was adopted. A total of 240 farm households were selected, comprising 120 respondents each from Junagadh and Jamnagar districts. Information was collected through personal interviews using a well-structured and pre-tested interview schedule.

2.3 Analytical Technique

A total of eleven constraints associated with the adoption of adaptation strategies were identified through the field survey and expert consultation. Farmers were requested to rank these

constraints according to their perceived severity. The Rank Based Quotient (RBQ) method developed by Sabarathnam (1988) was used to analyse the constraints faced by farmers in adopting adaptation strategies. The RBQ was computed using the following formula:

$$RBQ = \frac{\sum F_i [(n+1)-i]}{N \times n} \times 100$$

Where,

F_i = Frequency of the farmers perceiving the i^{th} ranked constraint;

N = Number of farm respondents;

n = Number of constraints perceived; and

i = Rank of the constraint.

Based on the computed RBQ values, the identified constraints were arranged in descending order, with the constraint having the highest RBQ value assigned the first rank, followed by the remaining constraints in descending order of their RBQ values. The Rank Based Quotient (RBQ) values were computed using Microsoft Excel.

3. Results and Discussion

3.1 Constraints hindering adaptation strategies

The adoption of climate adaptation strategies is influenced by several production, institutional, technological and socio-economic constraints. The Rank Based Quotient analysis indicated that farmers encountered multiple barriers while adopting climate-resilient agricultural practices.

Table 3.1: Constraints hindering adaptation strategies among farm households in the Saurashtra region ($n = 240$)

Sr. No.	Constraints	Junagadh RBQ Score	Rank	Jamnagar RBQ Score	Rank	Overall RBQ Score	Rank
1	Lack of adequate financial resources limiting adoption of improved agricultural practices	60.15	IV	27.58	XI	43.86	VII
2	Lack of awareness and technical knowledge about climate-smart technologies	30.23	XI	39.32	VIII	34.77	XI
3	Limited availability of quality inputs such as seeds, fertilizers and equipment	37.65	IX	32.58	X	35.11	IX
4	High cost associated with adopting new technologies and practices	43.64	VII	49.62	VI	46.63	VI
5	Inadequate extension services and technical guidance from institutions	31.97	X	37.65	IX	34.81	X
6	Lack of timely and reliable climate/weather information	47.42	VI	57.88	IV	52.65	IV
7	Limited access to institutional credit and government support schemes	41.89	VIII	44.92	VII	43.41	VIII
8	Market-related constraints such as price fluctuation and poor market access	47.80	V	53.41	V	50.61	V
9	Labour shortage and high labour costs	85.68	II	84.85	II	85.27	II
10	Small landholding size restricting adoption of advanced technologies	75.00	III	82.05	III	78.52	III
11	Uncertainty about the performance of new technologies under changing climatic conditions	98.56	I	90.15	I	94.36	I

Note: RBQ refers to Rank Based Quotient

The Rank Based Quotient analysis revealed that uncertainty regarding the performance of newly introduced technologies under changing climatic conditions emerged as the most severe constraint perceived by the respondents, registering the highest overall RBQ score of 94.36. Farmers expressed hesitation in adopting unfamiliar technologies because of uncertainty regarding their economic returns and field performance under highly variable climatic conditions. Labour shortage coupled with continuously increasing wage rates was ranked as the second most important constraint (RBQ = 85.27), followed by small operational landholdings (RBQ = 78.52). These constraints substantially limit farmers' ability to invest in and implement climate-resilient agricultural practices. Conversely, lack of awareness regarding climate-smart technologies (RBQ = 34.77) and

inadequate extension services (RBQ = 34.81) received comparatively lower RBQ scores, indicating relatively lower perceived severity among the respondents.

Although the overall ranking pattern remained largely similar across the two study districts, certain variations were observed. Farmers in Junagadh perceived financial constraints more severely than those in Jamnagar, whereas respondents from Jamnagar assigned relatively higher importance to small operational landholdings and inadequate access to timely weather information. These differences may be attributed to variations in resource availability, production environments and institutional support across the two districts.

The present findings are consistent with those of Adger *et al.* (2007) ^[1], who reported that economic inequality, weak

institutional arrangements and limited social capital substantially restrict farmers' adaptive capacity. Likewise, Nhemachena and Hassan (2007) ^[6] observed that inadequate institutional credit, poor extension services and lack of climate information significantly constrained farmers' adoption of adaptation strategies, emphasizing the need for stronger institutional support to improve resilience. Similar institutional and financial constraints were also evident in the present investigation.

The present findings further corroborate those of Moser and Ekstrom (2010) ^[4], who categorized adaptation barriers into cognitive, institutional, resource and political dimensions and concluded that fragmented policies, limited technical expertise and inadequate institutional coordination significantly hinder adaptation efforts. Similarly, Reidsma *et al.* (2010) ^[8] reported that knowledge gaps, institutional rigidity and market-related constraints restrict the adoption of climate adaptation practices. These observations support the need for integrated institutional and policy interventions to facilitate farmers' adaptation to climate variability.

The results are also in agreement with Uddin *et al.* (2014) ^[11], who reported that education, income, farm size and cooperative participation significantly influenced farmers' adaptive behaviour under changing climatic conditions. Likewise, Fadoju (2022) ^[3] demonstrated that transaction costs, repayment capacity, land ownership and off-farm income substantially affected farmers' access to institutional credit, thereby limiting investment in improved agricultural technologies and adaptation measures. These findings highlight the importance of strengthening financial services and institutional support for promoting adaptation among farm households.

Similarly, Suhaeb and Tamrin (2024) ^[10] emphasized that successful climate adaptation requires community participation, stakeholder collaboration and locally appropriate adaptation strategies. Mwenje and Kumar (2024) ^[5] also highlighted the importance of integrating climate adaptation into development planning through coordinated institutional mechanisms and enhanced climate awareness to strengthen long-term resilience. These recommendations are highly relevant for the Saurashtra region, where coordinated institutional support is essential for improving farmers' adaptive capacity.

The present findings also closely resemble those reported by Sarkar *et al.* (2010) ^[9], who identified extreme poverty, lack of education, inadequate knowledge of adaptation practices, poor access to weather forecasting information and limited awareness regarding climate change as the major constraints affecting farmers' adaptive capacity in the Sundarbans region of India. The authors emphasized participatory planning, resource conservation and institutional support as effective strategies for strengthening resilience against climate change, which are equally relevant in the context of the present study.

Policy implication

The findings suggest that improving farmers' adaptive capacity requires a comprehensive policy approach integrating technological, institutional and financial interventions. Strengthening extension services through regular capacity-building programmes, promoting climate-smart agricultural technologies, expanding location-specific weather advisory services and improving farmers' access to

institutional credit would substantially facilitate climate adaptation. In addition, ensuring the timely availability of quality inputs, improving rural market infrastructure and strengthening farmer producer organizations would encourage wider adoption of climate-resilient agricultural practices. Such integrated interventions would not only reduce farm vulnerability but also enhance agricultural sustainability and livelihood resilience in the Saurashtra region.

4. Conclusion

The present study identified and prioritized the major constraints hindering farmers' adaptation strategies in the Saurashtra region of Gujarat using the Rank Based Quotient technique. Uncertainty regarding the performance of new technologies, labour shortage and increasing wage rates, and small operational landholdings emerged as the most severe barriers limiting adaptation. The findings indicate that adaptation is influenced not only by technological factors but also by institutional, financial and market-related constraints. Therefore, coordinated efforts involving government agencies, extension organizations, financial institutions and farmer organizations are essential for promoting climate-resilient agricultural practices. Addressing these constraints through appropriate policy interventions would significantly enhance farmers' adaptive capacity, reduce farm vulnerability and contribute towards sustainable agricultural development under changing climatic conditions.

References

1. Adger WN, Agrawala S, Mirza MMQ, Conde C, O'Brien K, Pulhin J, *et al.* Assessment of adaptation practices, options, constraints and capacity. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE, editors. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cambridge: Cambridge University Press; 2007. p. 717-743.
2. Deressa TT, Hassan RM, Ringler C. Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Global Environmental Change*. 2009;19(2):248-255.
3. Fadoju AA. Credit constraints among farm households in Southwest Nigeria. *Agricultural Finance Review*. 2022;43(1):71-92.
4. Moser SC, Ekstrom JA. A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*. 2010;107(51):22026-22031.
5. Mwenje M, Kumar S. Climate adaptation challenges in African cities. *Sustainable Cities and Society*. 2024;12(1):56-72.
6. Nhemachena C, Hassan R. Micro-level analysis of farmers' adaptation to climate change in Southern Africa. *IFPRI Discussion Paper*. 2007;21(2):94-102.
7. Pokiya N, Swaminathan B, Agarwal D. Determinants of adaptation strategies to climate change impact on major field crops in Saurashtra region, Gujarat. *International Journal of Statistics and Applied Mathematics*. 2024;9(1):28-32.
8. Reidsma P, Ewert F, Lansink AO, Leemans R. Adaptation to climate change and climate variability in European agriculture: The importance of farm-level

- responses. *European Journal of Agronomy*. 2010;32(1):91-102.
9. Sarkar S, Padaria RN, Vijayraghavan K. Climate vulnerability in Sunderbans. *Indian Journal of Agricultural Economics*. 2010;18(3):51-64.
 10. Suhaeb MI, Tamrin M. Community adaptation strategies. *Sustainability*. 2024;13(1):24-48.
 11. Uddin MN. Farmers' adaptation strategies to climate change in Bangladesh. *Climate Risk Management*. 2014;2:1-14.