P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 10; October 2025; Page No. 304-306

Received: 28-07-2025
Accepted: 30-08-2025

Indexed Journal
Peer Reviewed Journal

# Risk perceptions of climate change realities in agriculture among farmers in Bundelkhand agroclimatic zone of Madhya Pradesh

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**DOI:** https://www.doi.org/10.33545/26180723.2025.v8.i10e.2550

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**Abstract**

The study aimed to assess the level of perception and awareness among farmers regarding the impacts and realities of climate change in agriculture in Bundelkhand Agro-climatic zone of Madhya Pradesh, India. A descriptive research design was adopted for this study. Overall risk perception scores were categorized as low, medium and high. The results revealed that 55.32 per cent of the farmers had a high level of risk perception, 24.26 per cent had a moderate level of risk perception and 19.57 per cent exhibited low risk perception. This study concludes that the perception and awareness of climate change among farmers is generally adequate but there is a pressing need for enhanced climate education, locally relevant extension services and practical adaptation strategies to strengthen agricultural resilience.

**Keywords:** Climate change, farmer risk perception, climate awareness, environmental change

## Introduction

Climate change is emerging as one of the most critical challenges to sustainable agricultural development in India. Increasing temperature variability, erratic monsoon patterns, and the growing frequency of extreme climatic events are projected to significantly impact agricultural productivity and food security (Fellmann, 2012; IPCC, 2007) [1, 2]. Empirical evidence indicates that even a marginal temperature rise of 0.5 °C could reduce wheat yield by approximately 0.45 tons per hectare, particularly in rainfed regions (Lal *et al*., 2003) [3]. Farmers perceived that outbreak of insect pest and disease, emergence of weed species, declination in soil nutrient status, high input cost, reduced grain quality and low market price to produce are impact of the climate change while cent per cent farmers perceived declination in water table and low production are the impact of climate change (Shrivastava *et al*., 2018) [5].

These trends underline that the overall productivity of Indian agriculture may decline by 10–40% by the end of the century, depending on the pace of climate change and the region's adaptive capacity (IPCC, 2007; Singh, ICAR) [2]. This situation not only threatens the livelihoods of millions of small and marginal farmers but also exacerbates the risks of food insecurity and rural poverty. Therefore, adaptation strategies—such as the development of climate-resilient crop varieties, adoption of efficient irrigation and soil management practices, and strengthening of agricultural extension and early warning systems—are crucial.

To mitigate these projected impacts, India must promote climate-smart agricultural policies that integrate scientific innovation with traditional knowledge and local resource management. Strengthening institutional frameworks and enhancing farmers' adaptive capacities at the community level will be essential for ensuring long-term agricultural sustainability and resilience in the face of changing climatic conditions (Fellmann, 2012; Singh, ICAR) [1, 6]. Keeping this in mind it is necessary to know the farmers point of view and their risk perception about climate change.

## Methodology

Under National Innovation on Climate Resilient Agriculture (NICRA) project, nine districts i.e. Datia, Chhatarpur, Tikamgarh, Morena, Guna, Ratlam, Satna, Jhabua and Balaghat were identified as vulnerable districts. These 9 vulnerable districts lie under 6 ACZs i.e. Bundelkhand Region, Gird Zone, Malwa Plateau, Jhabua hills, Kymore plateau, Satpura hill zone and Chhattisgarh plain respectively. Out of these 6 ACZs, Bundelkhand Region was selected for the present study as these agro-climatic zones shares the highest number of vulnerable districts in the state. Climate change risk perception is conceptualized as farmers understanding of the likelihood of dangers or negative consequences related with climate change. A list of all the beneficiary farmers from all three district was prepared and the sample size is estimated by using Cochran's formula. After that farmers were selected from each district by using proportionate to population method and thus 119 farmers were selected from Tikamgarh, 81 farmers from Chhatarpur and 107 farmers from Datia district thus making the total sample size for the study was 307 farmers. Risk perception of farmers was measured using scale developed by Raghuwanshi and Ansari. The scale consisted of 20 statements and the responses of the respondents were recorded on five-point continuum

representing strongly agree, agree, undecided, disagree and strongly disagree with scores of 5, 4, 3, 2, and 1, respectively. The perception score of each respondent can be calculated by adding up the scores obtained by him/her on all the items. The perception score on this scale ranges from a minimum of 20 to a maximum of 100. The farmers were 46 categories based on their score into three categories *viz*. Low, medium and high-risk perception.

## Results and Discussion

### 1. Risk Perception of farmers towards climate change

Risk perception is the subjective evaluation of the adverse impacts on human well-being or the environment resulting from a specific event or circumstance (Diyyala *et al*, 2025). Farmers' perceptions play a prominent role in determining their readiness to respond and adapt to environmental changes and their willingness leads to effective implementation of new technologies which ultimately enhances resilience, productivity and sustainability in agricultural systems.

Table 1 presents the distribution of farmers according to their perceived risk towards climate change. The mean scores of the statements ranged from 3.85 to 5.70, indicating that most farmers strongly agreed that climate change has significant adverse effects on agriculture and allied activities.

The highest mean score was recorded for the statement "Uncertainty in rainfall patterns is one of the major factors affecting crop production" (Mean = 5.70, Rank I), followed by "Adverse weather events have affected adaptation and mitigation practices over the years" (Mean = 5.63, Rank II) and "The livelihood pattern of farmers is changing due to changing climatic conditions" (Mean = 5.33, Rank III). These findings suggest that farmers are highly aware of the direct and visible consequences of climate change, particularly those related to rainfall irregularity and extreme weather events that influence crop production and livelihoods.

Other statements such as "Soil erosion is increasing day by day due to heavy rains" (Mean = 5.28, Rank IV), "Climate change has led to changes in cropping seasons and cropping practices of farmers" (Mean = 5.14, Rank V), and "Agriculture sector has become more vulnerable due to climate change" (Mean = 5.05, Rank VI) also received high mean values, emphasizing that farmers recognize the growing vulnerability of the agricultural sector to changing climatic conditions.

Moderate agreement was observed for statements like "The temperature is increasing every year due to climate change" (Mean = 5.03, Rank VII), "The productivity of various crops has changed due to climate change" (Mean = 4.92, Rank VIII), and "Excessive variation adversely affects the productive capacity of livestock" (Mean = 4.89, Rank IX). Similarly, farmers also agreed that "Livestock rearing has become vulnerable due to climate change" (Mean = 4.87, Rank X) and "Climate change has made it difficult to decide when to start sowing and harvesting" (Mean = 4.85, Rank XI).

Comparatively lower mean scores were observed for "Extreme cold weather, strong wind and dense fog affect agriculture" (Mean = 4.80, Rank XII) and "The frequency of drought has affected agricultural production" (Mean = 4.65, Rank XIII).

Statements such as "Deforestation has become more serious due to climate change" (Mean = 4.64, Rank XIV) and "Biodiversity is threatened by climate change" (Mean = 4.62, Rank XV) were also agreed upon but to a slightly lesser extent.

Lower levels of agreement were noted for "Climate change is the most important problem of today's time" (Mean = 4.20, Rank XVI), "Climate change is caused by both environmental and human activity" (Mean = 4.15, Rank XVII), and "Weed and pest attacks have increased nowadays as compared to earlier times" (Mean = 4.10, Rank XVIII).

The least mean scores were recorded for "The land use pattern is changing due to the changing climatic conditions" (Mean = 3.94, Rank XIX) and "Many species of plants and animals have become extinct due to the changing climate" (Mean = 3.85, Rank XX), indicating that farmers were comparatively less aware or less convinced about the long-term and indirect ecological consequences of climate change.

### 2. Overall risk perception of farmers towards climate change

In respect to the farmers overall understanding of the likelihood of dangers or negative consequences related with climate change, the data in table 2. Indicated that maximum i.e 44.62 per cent the farmers were having medium risk perception followed by 36.81 per cent of the farmers were having high whereas, 18.57 per cent of the farmers had low risk perception, respectively. The reason that, most of the farmers observed the change in climate and its adverse effects on crop production and post-harvest management of crop, more weed and infestation of diseases, occurrence of extreme hot and cold weather and uncertainty of rainfall all are directly or indirectly consequence of climatic change. The result of the study is similar to that of Ansari and Raghuwanshi.

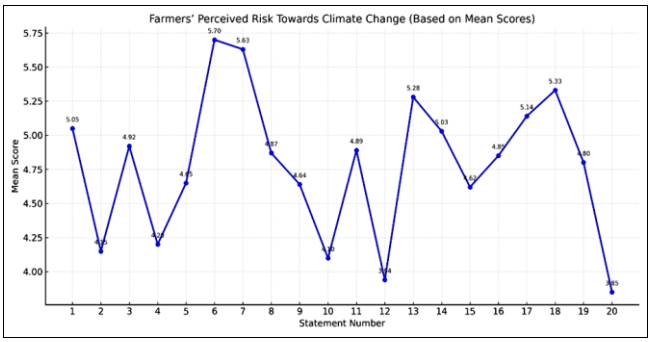
**Table 1:** Distribution of farmers on the basis of their perceived risk towards the climate change. (N=307)

| S. No. | Statements | Mean | Rank |
|---|---|---|---|
| 1 | Agriculture sector has become more vulnerable due to climate change. | 5.05 | VI |
| 2 | Climate change is caused by both environmental and human activity. | 4.15 | XVII |
| 3 | The productivity of various crops has changed due to climate change. | 4.92 | VIII |
| 4. | Climate change is the most important problem of today's time. | 4.20 | XVI |
| 5 | The frequency of drought has affected agricultural production. | 4.65 | XIII |
| 6 | Uncertainty in rainfall patterns is one of the major factors affecting crop production. | 5.70 | I |
| 7 | Adverse weather events have affected adaptation and mitigation practices over the years. | 5.63 | II |
| 8 | Livestock rearing has become vulnerable due to climate change. | 4.87 | X |
| 9 | Deforestation has become more serious due to climate change. | 4.64 | XIV |

| | | | |
|---|---|---|---|
| 10 | Weed and pest attacks have increased nowadays as compared to earlier times. | 4.10 | XVIII |
| 11 | Excessive variation adversely affects the productive capacity of livestock. | 4.89 | IX |
| 12 | The land use pattern is changing due to the changing climatic conditions. | 3.94 | XIX |
| 13 | Soil erosion is increasing day by day due to heavy rains. | 5.28 | IV |
| 14 | The temperature is increasing every year due to climate change. | 5.03 | VII |
| 15 | Biodiversity is threatened by climate change. | 4.62 | XV |
| 16 | Climate change has made it difficult to decide when to start sowing and harvesting. | 4.85 | XI |
| 17 | Climate change has led to changes in cropping seasons and cropping practices of farmers. | 5.14 | V |
| 18 | The livelihood pattern of farmers is changing due to changing climatic conditions. | 5.33 | III |
| 19 | Extreme cold weather, strong wind and dense fog affect agriculture. | 4.80 | XII |
| 20 | Many species of plants and animals have become extinct due to the changing climate. | 3.85 | XX |

**Table 2:** Distribution of respondents according to their overall perception on climate change (n =307)

| S. No. | Categories | Respondents | |
|---|---|---|---|
| | | Frequency | Percentage |
| 1. | Low Risk Perception (20-47) | 57 | 18.57 |
| 2. | Medium Risk Perception (48-75) | 137 | 44.62 |
| 3. | High Risk Perception (75-100) | 113 | 36.81 |
| Total | | 307 | 100 |




## Conclusion

The findings clearly indicate that farmers in the study area possess a high level of awareness and concern regarding the adverse impacts of climate change on agriculture. Most farmers recognized the increasing uncertainty in rainfall patterns, frequent extreme weather events, and resulting challenges to crop production and livelihoods. However, their understanding was comparatively lower for indirect or long-term effects, such as biodiversity loss and land-use changes. The predominance of high-risk perception (55.32%) suggests that farmers are not only aware of climate-induced risks but also acknowledge the urgent need for adaptive and preventive measures. Therefore, it is essential to strengthen climate literacy, extension services, and adaptive capacity-building programs to translate this awareness into practical resilience strategies, ensuring sustainable agricultural development in the face of changing climatic conditions.

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