**Original Research Article**

**Perceptions and Awareness of Climate Change Realities in Agriculture Among Farmers in Tamil Nadu, India**

**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 Tamil Nadu, India. A descriptive research design was adopted for this study. It was conducted in Chidambaram during January to April 2025. 60 farmers who cultivates paddy were selected using simple random sampling method and data were collected through a structured questionnaire based on a 28-item perception scale. Each item was rated on a three-point continuum scale (Agree, Agree to Some Extent, Disagree). Overall perception scores were categorized as low, medium and high. The results revealed that 63.33 per cent of the farmers had a medium level of perception, 20.00 per cent had a high level of perception and 16.67 per cent exhibited low perception. Majority of respondents (65.00 %) agreed that climate change results from both natural processes and human activities and followed by 61.67 percent of farmers report that it mainly due to human actions. Even though moderate levels of perception and awareness were common, specific knowledge gaps related to biodiversity, soil health and water resources persist. This study concludes that the perception and awareness of climate change among paddy 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 perception, Agricultural vulnerability, Tamil Nadu, Climate awareness, Adaptive capacity, Rural livelihoods, Environmental change.

**1.INTRODUCTION**

Agriculture remains India’s economic backbone (≈15% of GDP and 40.00 % of the population) and is highly climate-sensitive (World Economic Forum, 2024). Over the last decades India’s climate has warmed and become more and more erratic (Deccan Herald, 2024). Rising temperatures can reduce crop yields, as many crops have optimal temperature ranges for growth (Jbawi, 2020). Warmer climates allow pests and diseases to thrive, further threatening to crop production (Acharya *et al.,* 2024). As per the official Economic Survey notes of India states that the heatwaves, uneven monsoons and unseasonal rains have recently caused widespread crop damage – driving food inflation from about 3.80 per cent FY2022 to over 7 per cent by FY2024 (Economic Times,2024). Changes in rainfall patterns and groundwater table leads to droughts or flooding, affecting soil moisture and crop health (Anjum *et al.,* 2024). Indeed, India lost roughly 33.9 million hectares of cropped area which is used for cultivation practices to excessive rain and another 35.0 million to drought during 2015–2021(World Economic Forum, 2024). The economic toll is immense: extreme climate events in 2021 alone contributed to an estimated $159 billion in lost labour output across agriculture and related sectors (World Economic Forum, 2024). Farmers often perceive climate change through observable changes in weather patterns, such as increased temperatures and altered rainfall, which directly affect their livelihoods (Reddy *et al.,* 2022). In regions like North India, farmers report negative impacts on water availability and crop productivity, leading to diverse adaptation strategies based on socio-economic factors (Mitra *et al.,* 2021). With 1.4 billion people, many in poverty, India's socio-economic fabric is at risk due to climate-induced challenges, necessitating urgent climate action and adaptation strategies (Hussain *et al.,* 2024). Roughly 38.00 % of Tamil Nadu’s land is cultivated. In that, paddy dominating much of it (The Federal**,** 2024). For an instance, Cuddalore district alone cultivates about 142,741 hectares of rice (The Federal**,** 2024). Extended dry spells and cyclone-induced floods (e.g. Cyclone Vardah in 2016) have both afflicted this coastal district, forcing farmers to abandon or reschedule traditional paddy cultivation practices (BBC News, 2016). Rising temperature and changing rainfall patterns in Tamil Nadu, particularly evident in the agricultural regions of Cuddalore, highlight the urgent need for localized adaptation strategies. Common strategies include crop diversification, improved water management and adoption of drought-resistant varieties (Amruddin *et al.,* 2024). Local knowledge plays a significant role in adaptation, as seen in Thailand, where farmers effectively manage water resources during droughts (Sheikh *et al.,* 2024). Collaborative efforts between farmers, researchers and policymakers are essentially required for implementing sustainable agricultural practices that can enhance resilience to climate change (Amruddin *et al.,* 2024). Understanding how farmers in Tamil Nadu’s Cuddalore district perceive climate-related threats and the adaptation methods they employ enables policy-makers to draft and design more effective, context-specific responses. Incorporating farmers’ experiences and perceptions is essential for crafting agricultural policies that are resilient to climate change. This research paper plays a prominent role on capturing the perception of farmers towards climate change which leads to support the development of practical, resilience-oriented strategies for Indian agriculture.

**2. METHODOLOGY**

The present study adopted a descriptive research design to explore the perceptions, awareness and experiences of paddy farmers in response to climate change. The research was conducted in Chidambaram Taluk of Cuddalore District, Tamil Nadu. This Taluk was purposively selected based on expert consultations with agricultural officers, who identified it as a region significantly affected by climate change impacts such as erratic rainfall, rising temperatures, and crop failures. Within this village, 60 paddy farmers were selected using a simple random sampling method. However, the sampling frame was restricted to farmers who had been directly affected by climate-related stresses, ensuring that the respondents had relevant exposure and insights into the phenomenon being studied. Data collection was done using a structured and pre-tested questionnaire. The scale and st ructure of the questionnaire for perception of farmers towards climate change were adapted with some modifications of the research tool which was developed by Khunt Krimpal Ratilal (2022). The scale employed a three-point continuum agree, agree to some extent, and disagree to measure farmer perceptions on various statements related to climate change. The questionnaire included close-ended questions and it covered farmers’ perceptions of climate change. All interviews were conducted face-to-face in Tamil to ensure clear communication and accurate data collection. Informal discussions during farm visits also provided deeper contextual understanding. The data collected were analysed using percentage analysis to describe the distribution of responses. Ethical considerations were strictly followed throughout the research process (Kamran *et al.,* 2023). Informed consent was obtained from all participants and their anonymity and confidentiality were ensured (Grimwood *et al.,* 2023). Participation was voluntary and farmers were given the freedom to withdraw at any stage of the study.

**3. FINDINGS AND DISCUSSION**

**3.1. PERCEPTION OF FARMERS TOWARDS CLIMATE CHANGE**

People’s perception is very much useful to establish the fact that the particular region is facing direct or indirect problems in agriculture and other activities due to climate change (Khunt, 2022). 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. To identify farmers’ perceptions towards climate change, a specifically enhanced and designed measurement scale was utilized. Complete responses were obtained from all respondents and their perception levels were accordingly evaluated.

**3.1.1. OVERALL PERCEPTION OF FARMERS TOWARDS CLIMATE CHANGE**

The overall perception of the respondents towards climate change was studied and the results are given in table 1 & fig.1.

**Table 1. Distribution of respondents according to their overall perception on climate change (n = 60)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Category** | **Number**  | **Percentage** |
| 1 | Low | 10 | 16.67 |
| 2 | Medium | 38 | 63.33 |
| 3 | High | 12 | 20.00 |
| **Total** | **60** | **100.00** |

It could be seen from the Table 1 that, more than three-fifth of respondents (63.33 %) had a medium level of perception about climate change. This indicates a moderate level of understanding among respondents regarding its causes, impacts and implications in agriculture. Notably, 20.00 per cent of respondents fell under the high level of perception category, suggesting a growing number of farmers are highly informed and possibly more proactive in adapting to climate-induced challenges. Below one-fifth of respondents are (16.67 %) demonstrated a low level of perception. This highlighting a critical gap in awareness that may hinder timely response and adaptation. This distribution indicates and emphasizes the need for targeted climate education, extension services and localized interventions to elevate perception levels, especially among the less informed group, to ensure resilient and informed agricultural communities. These findings are in agreement with the findings of Khunt, 2022, who also reported that similar findings in his study.

**3.1.2. STATEMENT WISE PERCEPTION OF FARMERS TOWARDS CLIMATE CHANGE**

The categorization of respondents based on their perception, statement wise scores is shown in table 2 and illustrated in figure 2.

**Table 2. Distribution of respondents according to their perception towards climate change. (n = 60)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No.** | **Statements** | **Agree** | **Agree to some extent** | **Disagree** |
| **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** |
| 1 | The agricultural sector has become more vulnerable due to climate change. | 32 | 53.33 | 24 | 40.00 | 4 | 6.67 |
| 2 | Climate change is currently the most urgent challenge. | 35 | 58.33 | 20 | 33.33 | 5 | 8.33 |
| 3 | Rising temperatures occur every year as a result of climate change. | 35 | 58.33 | 18 | 30.00 | 7 | 11.67 |
| 4 | The frequency and intensity of dry spells have negatively affected agricultural productivity. | 33 | 55.00 | 19 | 31.67 | 8 | 13.33 |
| 5 | Human activities are responsible for climate change. | 37 | 61.67 | 14 | 23.33 | 9 | 15.00 |
| 6 | Climate change has increased the vulnerability of livestock farming. | 34 | 56.67 | 15 | 25.00 | 11 | 18.33 |
| 7 | Weed and insect pest infestations are becoming increasingly common. | 28 | 46.67 | 29 | 48.33 | 3 | 5.00 |
| 8 | Crop diseases are more prevalent now than in the past. | 31 | 51.67 | 25 | 41.67 | 4 | 6.67 |
| 9 | Climate change results from both natural processes and human-induced environmental changes. | 39 | 65.00 | 21 | 35.00 | 0 | 0.00 |
| 10 | Rainfall patterns have become increasingly erratic. | 27 | 45.00 | 26 | 43.33 | 7 | 11.67 |
| 11 | Unpredictable and inconsistent rainfall negatively affects crop production. | 25 | 41.67 | 22 | 36.67 | 13 | 21.67 |
| 12 | Extreme cold, strong winds, and dense fog hinder farming activities. | 21 | 35.00 | 25 | 41.67 | 14 | 23.33 |
| 13 | Rising temperatures lead to heat stress, which harms crops. | 26 | 43.33 | 28 | 46.67 | 6 | 10.00 |
| 14 | Climate change has reduced the yield of various crops. | 27 | 45.00 | 24 | 40.00 | 9 | 15.00 |
| 15 | The decline in groundwater levels has made crop cultivation more costly. | 29 | 48.33 | 25 | 41.67 | 6 | 10.00 |
| 16 | Severe weather events result in greater nutrient loss into waterways. | 27 | 45.00 | 29 | 48.33 | 4 | 6.67 |
| 17 | Many farmers remain unaware of the consequences of climate change. | 21 | 35.00 | 20 | 33.33 | 19 | 31.67 |
| 18 | Climate change has intensified deforestation. | 21 | 35.00 | 29 | 48.33 | 10 | 16.67 |
| 19 | Farmers are adopting different strategies to adapt to and mitigate climate change effects. | 26 | 43.33 | 25 | 41.67 | 9 | 15.00 |
| 20 | Changing climatic conditions are altering farmers' livelihood patterns. | 28 | 46.67 | 22 | 36.67 | 10 | 16.67 |
| 21 | Climate change has made farmers' lives increasingly difficult. | 25 | 41.67 | 24 | 40.00 | 11 | 18.33 |
| 22 | The biodiversity of hilly regions is at risk due to climate change. | 27 | 45.00 | 23 | 38.33 | 10 | 16.67 |
| 23 | Climate change has complicated the timing of planting and harvesting. | 31 | 51.67 | 25 | 41.67 | 4 | 6.67 |
| 24 | Farmers' marketing strategies are negatively affected by climate change. | 24 | 40.00 | 25 | 41.67 | 11 | 18.33 |
| 25 | Climate change has minimal impact on the transportation of agricultural goods. | 27 | 45.00 | 25 | 41.67 | 8 | 13.33 |
| 26 | Excessive rainfall is accelerating soil erosion. | 26 | 43.33 | 28 | 46.67 | 6 | 10.00 |
| 27 | Changing climate conditions are altering cropping seasons and farming techniques. | 31 | 51.67 | 27 | 45.00 | 2 | 3.33 |
| 28 | Climate change-induced losses are widening the economic gap between wealthy and poor farmers. | 23 | 38.33 | 28 | 46.67 | 9 | 15.00 |

It could be noticed from the table 2, showed that the farmers’ perceptions about the impacts of climate change on agriculture and rural livelihoods. Majority of respondents (65.00 %) agreed that climate change results from both natural processes and human activities and 61.67 percent report that it due to human actions, indicating a well-informed understanding of its causes. More than half of the respondents (58.33%) recognized that the most urgent challenge is climate change and consistent rise in temperatures each year. Many respondents (56.67 %) observed that vulnerability of livestock farming increased due to climate change and 55.00 per cent of respondents reported that frequency and intensity of dry spells are increasing with its negative impact on agricultural productivity. These perception stems from respondents’ direct experiences with changes in weather patterns that includes prolonged heatwaves, irregular rainfall patterns, reduced water availability and declined crop and animal productivity. Slightly more than half of the respondents (53.33 %) reported that the agricultural sector has become more vulnerable due to climate change. Similarly, 51.67 per cent agreed that crop diseases are now more prevalent and changing climatic conditions are complicating planting and harvesting schedules, as well as altering cropping seasons and farming practices. The economic implications of climate change were evident, with 48.33 per cent highlighting the increased cost of cultivation due to declining groundwater levels. Nearly half of the respondents also expressed concerns about increased weed and pest infestations with altering farmers' livelihood patterns (46.67 %), erratic rainfall, minimal impact on the transportation of agricultural goods, risk of biodiversity in hilly regions, greater nutrient loss into waterways, yield reduction in various crops (45.00 %). More than two-fifth of respondents (43.33 %) implies that the rising temperatures causing heat stress in crops, soil erosion due to excessive rainfall. These results may due to farmer’s direct experience with climate-induced challenges such as increased pest and disease pressure, erratic rainfall with uneven pattern, soil degradation and crop loss with reduced yields, all of which disrupt agricultural productivity and threaten livelihood stability. Similarly, 43.33 per cent respondents agreed that farmers are adopting adaptation and mitigation strategies. More than two- fifth of respondents (41.67 %) noted the challenges such as climate change has made farmers' lives more difficult, Unpredictable and inconsistent rainfall negatively affects crop production and 40.00 per cent of respondents agreed that marketing strategies were disrupted. Nearly two-fifth of respondents (38.33 %) agreed that the climate change-induced losses are widening the economic gap between wealthy and poor farmers. Only 35.00 per cent of respondents are remain unaware of climate change, suggesting a relatively high level of awareness. Similarly, 35.00 per cent of respondents agreed that extreme cold, strong winds, and dense fog hinder farming activities and the climate change has intensified deforestation. These results may due to limited access to formal education about climate information. Perceptions were more divided regarding the impacts of cold stress, fog, and deforestation. Overall, the data indicates that farmers are highly perceptive of climate change’s multifaceted impacts and are increasingly conscious of the need to adapt, although the extent of perceived impacts varies across different dimensions of farming and livelihood. These findings are in agreement with the findings of Khunt, 2022, who also reported that similar findings in his study.

**4. CONCLUSION**

Thus, this study reveals that majority of farmers had a medium level of perception towards climate change. This finding indicating a reasonable level of awareness among farmers about the causes and impacts of climate change on agriculture, such as reduced crop yields with productivity, erratic rainfall, livestock stress and increased input costs. A notable level of share also demonstrated high perception, suggesting growing attentiveness and willingness to adapt. Finally, low level of perception among farmers indicates the need for focused and efficient interventions. To bridge this kind of gap and build resilience, policy efforts should prioritize region-specific climate related education, promote the adoption of climate-resilient technologies such as drought-tolerant seeds and micro-irrigation and expand access to localized weather and crop advisories through digital and community platforms (KhetiBuddy, 2023). Extension services should made prominent efforts which involve farmers, women and rural youth through participatory training and demonstrations. In addition to, subsidies and incentives for farmers play a vital role in supporting small and marginal farmers in transitioning to sustainable practices. Strengthening farmers’ perception and adaptive capacity through such integrated approaches is essential for creating climate-resilient agricultural communities which leads to sustainable development.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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