Evaluating The Effectiveness Of Government Policies In Addressing Climate Change Challenges For Farmers In Marathwada

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Climate change, Agriculture, Government policies, Soil testing, Adaptation strategies

Abstract
This research paper evaluates the effectiveness of government policies designed to address climate change challenges farmers face in the Marathwada region of Maharashtra. It explores how well these policies are communicated, their integration with traditional farming practices, and the role of local communities and NGOs in their implementation. The paper assesses the accessibility and impact of policies such as the Soil Health Card Scheme and other state and national-level agricultural support initiatives, providing insights into barriers faced by farmers in accessing these benefits. Additionally, it highlights how effective communication between farmers and authorities can enhance policy effectiveness in combating climate change.

Introduction Background and Context

Climate change has been a significant threat to global agriculture, with India, which is most dependent on farming, still being more vulnerable to the results. The country is highly susceptible to a wide array of ill impacts caused by climate change owing to changes in patterns of rains, rise in temperature, extreme weather circumstances (floods and droughts), and increased heatwaves. Farm output is unpredictable, soil erosion is in progress, water has become scarce, and hunger has acquired more excellent dimensions. Unluckily, among the highly indefensible areas, the Marathwada region, located in the Central part of Maharashtra, is nothing but a drought-bitten piece of land. Agriculture has long been in a commanding position as this region's principal occupation. It suffices to say that Marathwada has had to undergo repeated sufferings of severe droughts and water scarcity, leading to reduced agricultural yields, which only serve to have more significant negative impacts of climate change.

Marathwada belongs to the semi-arid part of Maharashtra, defined by the quality of rainfed dryland farming, and hence is left highly susceptible to the calamity of climate change and heavy rainfall, only constituting a slow and inefficient method for irrigation. The previous two decades have seen drastic droughts, threatening extreme agrarian losses due to crop failures, high-level declines, and immense economic losses to farmers. Some crops such as cotton, groundnuts, and soybeans- the major contributors to the local economy- have been especially hit by various erratic climatic events. With rising temperatures influencing the growth cycles of the crops and lowering the yields, these raiders are further stripping the unpredictable workings of farming- such that the currently overused irrigation water may leave a crisis regarding water availability. Such a scenario where the partially uneducated farmer sits weakly from one crop failure to another shall mean a greater risk of food insecurity, poverty, and migration.

To combat the adverse impacts of climate change on agriculture, the government has promulgated several local and federal policies to assist farmers in adapting farming systems resilient to this stress. In the last few years, the Maharashtra government and the Government of India have also introduced several schemes to address these issues. Leading among them are the Soil Health Card Scheme, the Pradhan Mantri Fasal Bima Yojana (PMFBY), and the National Adaptation Fund for Climate Change (NAFCC), all aimed at increasing the resilience of agriculture against climate variability. The policies are being made to provide financial help, better the soil condition, alleviate the risk of crop loss, and improve the water conservation scheme configuration.

For one, the Soil Health Card Scheme helps Marathwada farmers better understand the soil's condition and take corrective measures. This scheme offers the farmer an individualised soil health assessment report, which would then invite attention to better practice in the corrective management of nutrients and for observing legitimate alternations for better fertiliser use and soil amendment practices that allow for an increase in yield production or to reduce the cost of chemical fertilisers, which are grossly applied in most parts of India. Secondly, the PMFBY stands as a farmer insurance scheme, protective of the plans of the farmers depending on the market and not liable to any financial ruin under crop loss at the end of the year. Still, much remains to be done regarding the lack of clear information, the inaccessibility of awareness, and the gaps in

communication with farmers.

Traditionally, the adaptation to climate change by using traditional knowledge and practices has also been significantly related to and yet a vital part of being taped in the Marathwada context. Indian farmers, especially in rural and tribal areas, have historically depended on the ingenuity of their Indigenous knowledge system and practices for understanding and adapting to climatic changes over many generations. Such strategies are based on substantial native primary resources regarding the ecosystem, seasons, and soil conditions. For instance, water conservation through rainwater-harvesting techniques, crop rotation, and mulching is traditional in most other Indian-origin cultures. A culture still exists that uses organic fertilisers and other conventional control methods for pest prevention. These age-old Indigenous skills had lent their resilience for buffering current-day hardships from the times when the weather was more predictable; it is becoming harder to rely uncritically on such practices due to the age-old "impermanence" of weather patterns and the relentless demand of modern agriculture.

Community actions, too, are pivotal towards the adaptation to climate change for the benefit of farmers' efforts. The compound traditional wisdom and communal support in rural communities have often been the backbone of agricultural resilience. Several community- based partnerships, farmer associations, and village panchayat groups have assumed much leadership in these areas of water resources for their conservation, irrigation improvement, and government scheme dissemination. Nongovernmental organisations (NGOs) and community- based organisations (CBOs) have facilitated the creation of awareness of climate change, the promotion of sustainable agricultural practices, and the delivery of government support to farmers. They can reach out to those in society who are forgotten or less privileged about bridging the policy processes.

However, despite the mighty worth of traditional knowledge and community action, there is now a need to integrate both conventional and scientific methods. This may promote greater resilience of Marathwada's farming community to climate change. Advocacy alone will not solve the problem; the government must have realised the enveloping value of traditional knowledge. One great appeal for bridging the communication gaps between the authorities and farmers is this peculiar feature that brings policy directives to the farmers but deprives them of the advantage recommended these-wise so that they may serve themselves in ways they see helpful. Communication gaps need to be bridged through extension programs reaching out to the farmers; other means include using digital platforms to disseminate information.

Literature Review:

Marathwada in Maharashtra has suffered immense impacts of climate change, especially in agriculture, due mainly to its drought-prone nature. Whenever the 'annual deficit' catches up with the 'monsoons,' farmers start attempting to water crops by digging wells, from which they have derived few returns in the last several centuries (Sahay, 2012). The subject of the research guide mentioned by Kulkarni et al. (2018) is that the primary crops in Marathwada, for example, cotton, groundnut, and soybean, are incredibly climate-sensitive. This renders irregular harvests and financial instability for the farmer.

Over time, this region has moved from an environment where monsoon rains provided a relatively dependable farming landscape to one fraught with uncertainties about rainfall occurrence and intensity. This has caused more vulnerabilities and subjected farmers to at least a few more climate-induced disasters (Gokhale, 2017). Drought in Marathwada, or its history, has complicated life as the region is already thirsty, and the topic of relief work and adaptation in the face of drought is of great consequence (Chavan, 2019).

Government Policies on Agriculture and Climate Change:

Numerous government policies on national and state levels have been initiated in the wake of climate commotions, targeting agricultural sustainability and climate resilience. For example, the Soil Health Card Scheme strives to improve soil fertility management by providing farmers with information on soil health and nutrient status to make informed decisions regarding nutrient management fertilisers and crop management (Patil, 2017). The Pradhan Mantri Fasal Bima Yojana (PMFBY) offers crop insurance for financial support to farmers hit by natural calamities, like drought and floods, which are now seen to be on the rise due to the impacts of climate change (Raghunath & Shinde, 2020).

Other schemes, such as the National Adaptation Fund for Climate Change (NAFCC), aim to promote climate-resilient agricultural practices, increase water-use efficiency, and restore soil health (Rathod, 2021). On the contrary, Mishra (2020) noted that the efficiency of these schemes is sometimes hampered given the lack of awareness, poor communication, and poor infrastructure for implementation in rural places like Marathwada. The programs are hardly God-sent blessings, so the gap between those who know these programs and these untouched farmers is never filled purportedly.

Communication among Farmers and Authorities:
Effective communication is crucial to influencing policy and playing instrumental roles in implementing measures for climate adaptation. However, studies have shown that farmers in rural regions, including drought-ridden areas like Marathwada, face significant problems obtaining legitimate, satiable information on government policies (Venkatesh & Nair, 2018). The barriers faced include illiteracy, poor download speed, connectivity, or interrupted signals: rough, adversarial terrain, whatever that may be; poor information accessibility; and zilch agricultural extension services. The absence of adequate information channels that may be opened to farmers on the advantages of selected government schemes can significantly cripple the effectiveness of climate change policies.
Jadhav (2020) suggests strengthening agricultural extension services and mobile phone apps for information dissemination to enable farmers to capitalise on timely information on government schemes. Such platforms can fill gaps in communication so that any farmer or beneficiary of government schemes is well informed about any changes in the policy, subsidies, or resources available to them.

Traditional Knowledge for Climate Adaptation:
Traditional knowledge is critical to climate change adaptation in Marathwada. Local farmers have used Indigenous practices such as rainwater harvesting, crop diversification, agroforestry, etc., to strengthen their resistance against the temporal variability in the Marathwada climatic condition. For example, traditional water management facilities, such as check dams and wells, have been of elemental significance in ensuring the presence of water during drought situations (Deshpande & Shinde, 2016). Water conservation not only saves water for the future but also enhances and improves soil fertility, thus helping to reduce the dependence on chemical fertilisers.
Khare (2017) describes how Indigenous knowledge, as a tool to assess weather conditions through traditional methods (using natural indicators like plant or animal behaviour), has played an essential role in shaping the farmers' decisions in Marathwada. With the help of weather intelligence, farmers adjust their crop planting dates and conduct irrigation operations as needed in response to climate change. Typically, traditional knowledge has been undermined by modern agricultural techniques, which may not always be designed to suit local conditions (Sharma, 2018).

Role of Communities and NGOs:
Community-based adaptation strategies have shown great promise in Marathwada. Local communities, including farmers, cooperative societies, and village panchayats, have all been busy putting up measures for climate-resilient farming and spreading awareness on select government schemes. Rathore and Jadhav (2019) mention that this involvement from communities has actively assisted in getting information across about water conservation and sustainable farming practices. NGO support and representation with hands like Swayam Shikshan Prayog (SSP) and BAIF Development Research Foundation have gradually proved instrumental in training farmers, refining access to resources, and ensuring proper implementation of government policies (Agarwal, 2020).
Together with technical support, organising workshops, and setting up networks for farmer support groups, these organisations raised the adaptability of climate change in agriculture in Marathwada. Farmers can mitigate climate risks in many ways through the financial and environmental resilience they have gained through community efforts (Deshmukh & Kulkarni, 2018).

Research Methodology Research Objectives
1. Assess farmers' awareness and adoption of government policies related to climate adaptation.
2. Evaluate the effectiveness of policy communication channels.
3. Identify barriers that prevent farmers from benefiting from government schemes.
4. Explore the role of traditional knowledge in climate adaptation strategies.

Hypothesis
Hypothesis 1: Relationship between farmers' awareness of government policies and their adoption of climate adaptation programs
H_0: There is no significant relationship between farmers' awareness of government policies and their adoption of climate adaptation programs.

H_1: Higher awareness of government policies positively influences farmers' adoption of climate adaptation programs.

Hypothesis 2: Socio-Economic Factors and Policy Utilization
H_0: Socioeconomic constraints and limited access to information do not significantly impact farmers' ability to benefit from government policies.
H_1: Limited access to information and socio-economic constraints are significant barriers preventing farmers from fully benefiting from government policies.

Study Area:
The study focuses on the Marathwada region of Maharashtra, an area particularly vulnerable to the impacts of climate change. Marathwada faces significant challenges due to recurring droughts, irregular rainfall patterns, and water scarcity, which negatively affect agricultural productivity. These climatic changes have intensified the existing vulnerabilities of farmers, making the region an ideal case study for examining the effectiveness of government policies and the role of traditional knowledge and community involvement in climate change adaptation. The area includes several districts, including Dharashiv, Beed, and Jalna, which are representative of Marathwada's agricultural landscape and socio-economic conditions.

Research Design:
This study will adopt a quantitative research technique to provide a comprehensive understanding of the challenges farmers in Marathwada face and the effectiveness of government policies in addressing climate change impacts. Sample size 169. The quantitative component will focus on assessing the awareness and use of government schemes, such as the Soil Health Card Scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY), and other relevant policies. This component will aim to identify trends in policy utilisation, farmers' access to information, and the perceived effectiveness of these schemes in mitigating climate-related risks.
The **qualitative component** will focus on understanding the role of traditional knowledge, communication barriers, and community involvement in addressing climate challenges. This will involve in-depth interviews and focus group discussions to explore how Indigenous practices are used for climate adaptation, how farmers perceive the policies, and the role of local communities and NGOs in implementing these schemes.

Data Collection Methods:
1. **Surveys:**
A structured questionnaire will be designed to collect quantitative data from farmers in Marathwada, focusing on awareness, adoption, and effectiveness of government schemes like the Soil Health Card Scheme and PMFBY. It will assess farmers' knowledge, participation frequency, and perceived benefits in improving crop yield, soil health, and sustainability. Additionally, the survey will gather demographic data (age, education, farm size) to analyse socio-economic influences on policy adoption. To ensure diverse representation, a stratified random sampling method will be used across multiple districts, providing valuable insights into how farmers access and utilise government policies for climate resilience.

"Statistical Evaluation and Policy Impact Assessment"
1. Awareness of national and state-level government policies addressing climate change and supporting agriculture.

Fig 1.

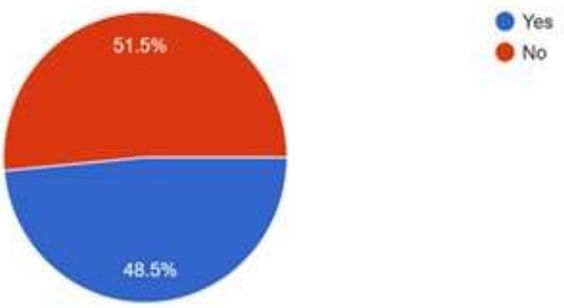


Figure no.1 data reveals a nearly even split in farmers' awareness of government policies addressing climate change and agriculture, with **48.5%** and **51.5% unaware**. This indicates a significant gap in policy outreach and communication. Despite the availability of schemes like the **Soil Health Card Scheme and PMFBY**, many farmers remain uninformed about their benefits. The findings highlight the need for **improved information dissemination** through **extension officers, digital platforms, and local community networks**. Strengthening communication channels can enhance policy adoption, ensuring farmers can effectively utilise government support to mitigate climate challenges and improve agricultural sustainability.

2 Farmers benefit from various Scheme in Marathwada

FIG.NO. 02

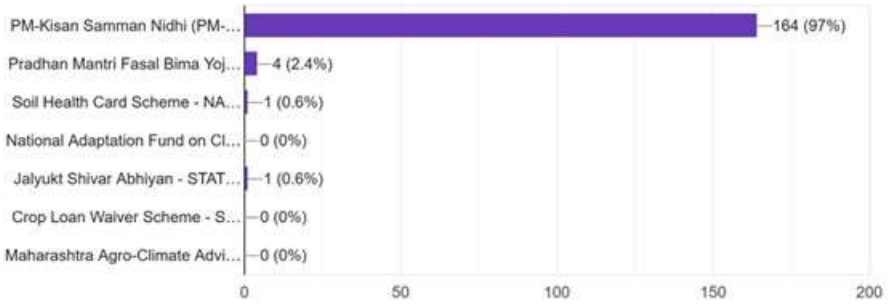


Table No. 01: Farmers benefit from various Scheme in Marathwada

Statistic	**Value**
Mean (μ)	24.29
Standard Deviation (σ)	55.37

The Fig No. 02 data indicates that PM-Kisan Samman Nidhi (PM-KISAN) is the most widely utilised scheme**,** with 97% of farmers benefiting. In contrast, other schemes like Pradhan Mantri Fasal Bima Yojana (PMFBY) (2.4%)**,** Soil Health Card Scheme (0.6%)**,** and National Adaptation Fund on Climate Change (NAFCC) (0%) have extremely low adoption rates**.** Similarly, Jalyukt Shivar Abhiyan (0.6%)**,** Crop Loan Waiver Scheme (0%)**,** and Maharashtra Agro-Climate Advisory Services (0%) show minimal participation. Table no. 01 shows that the high mean (24.29) and standard deviation (55.37) suggest unequal adoption of schemes, with PM-KISAN dominating while others remain underutilised. This indicates that financial aid programs are more accessible than climate resilience initiatives**,** likely due to **a** lack of awareness, complex application processes, and delays in benefits**.** Improved outreach, simplified procedures, and farmer-targeted education can enhance participation in crucial agricultural policies**.**

3 Farmers access information about these schemes through various sources.

Fig.No.03

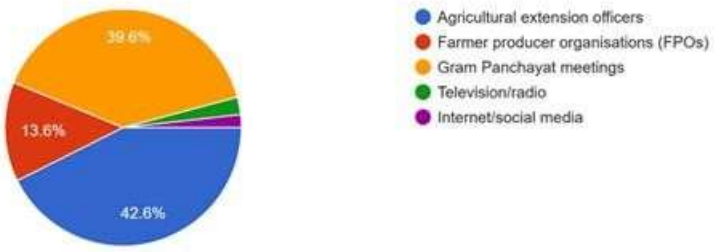


Table No.02: Farmers access information about these schemes through various sources.

Statistic	Value
Mean (μ)	23.93
Standard Deviation (σ)	15.23

Figure 03 shows that Farmers in Marathwada access government scheme information primarily through agricultural extension officers (42.6%) and Farmer Producer Organizations (39.6%), covering over 82% of dissemination. Gram Panchayat meetings (13.6%), television, radio, and social media play minor roles. Despite these sources, gaps persist due to limited awareness, complex application processes, and digital illiteracy. The dataset, with a mean of 23.93 and a standard deviation 15.23, shows moderate variability in information access. Strengthening outreach through digital platforms, community networks, and local meetings can bridge communication gaps, ensuring farmers benefit from schemes that enhance agricultural sustainability and climate resilience.

4. current government policies adequately address farmers' climate challenges in Marathwada.

Fig.No.04

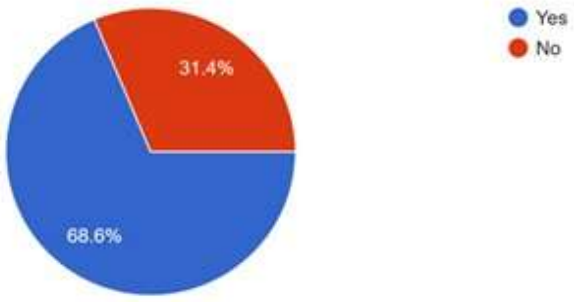
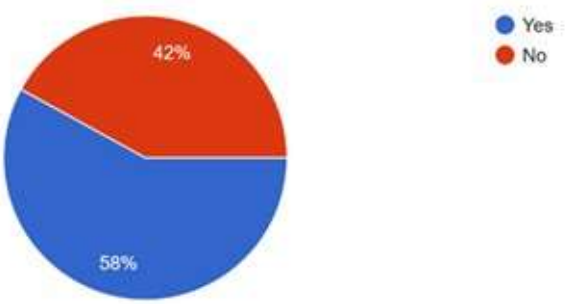


Figure no.04 shows that 68.6% of farmers in Marathwada believe current government policies adequately address climate challenges, while 31.4% disagree. While initiatives like PMFBY and soil health programs offer support, adoption barriers persist due to low awareness, complex processes, and inadequate local implementation. The 31.4% dissatisfaction indicates gaps in policy effectiveness, particularly in addressing drought resilience and water scarcity. Strengthening outreach, simplifying application procedures, and integrating traditional farming knowledge with modern techniques can enhance policy impact. Effective climate adaptation strategies must focus on region-specific needs to ensure long-term sustainability and resilience for Marathwada's farmers.

5. the government and private agencies offer soil testing services to Farmers.

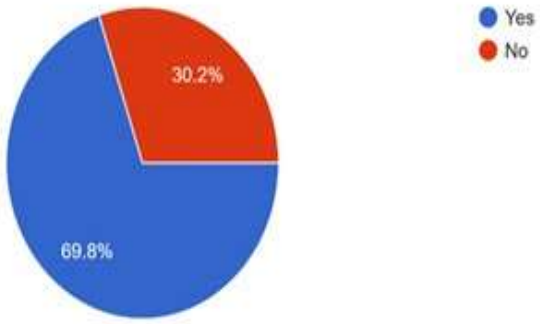
Fig 5



The figure no. 05 indicates that 58% of farmers find soil testing services effective, while 42% do not, highlighting mixed perceptions. Government soil testing programs like the Soil Health Card Scheme aim to provide accessible, science-based recommendations, yet awareness and accessibility challenges persist. Private agencies offer advanced, faster testing but at a higher cost, limiting affordability for small farmers. Responses with a mean satisfaction score of 50 and a low standard deviation (11.31) are moderately concentrated, suggesting balanced opinions. Enhancing outreach, reducing service costs, and integrating government-private collaborations can improve soil health management and adoption among farmers.

6. communication between farmers and authorities can help mitigate the impacts of climate change.

Fig 6



The survey reveals that 69.8% of farmers believe communication with authorities helps mitigate climate change impacts, while 30.2% disagree. This suggests that most farmers recognise the importance of information exchange in adopting climate-resilient practices. Government agencies and agricultural extension services are key in disseminating weather forecasts, policy updates, and sustainable techniques. However, the 30.2% scepticism highlights challenges like bureaucratic delays and ineffective outreach. Strengthening digital communication, increasing field engagement, and integrating local knowledge with scientific research can bridge this gap. Enhanced collaboration ensures better climate adaptation, resource management, and long-term agricultural sustainability.

7. Traditional knowledge and practices influence my water and farming strategies by guiding sustainable resource management and adaptive techniques.

Fig.No. 7

Figure no.07 shows that 49.1% of farmers believe the method is sometimes successful in addressing climate change challenges, while 39.6% find it consistently effective. This suggests that while the approach has considerable benefits, its effectiveness may vary based on factors like region, resources, and implementation. A smaller group (9.5%) sees it as ineffective, possibly due to changing climate patterns and evolving agricultural needs. The minor uncertainty suggests limited awareness or experience with the method. Strengthening farmer education, integrating modern techniques with traditional practices, and enhancing policy support can improve its overall impact and long-term sustainability.

8. Barriers preventing me from benefiting from these policies include lack of awareness, complex application processes, andlimited accessibility.

Fig 8

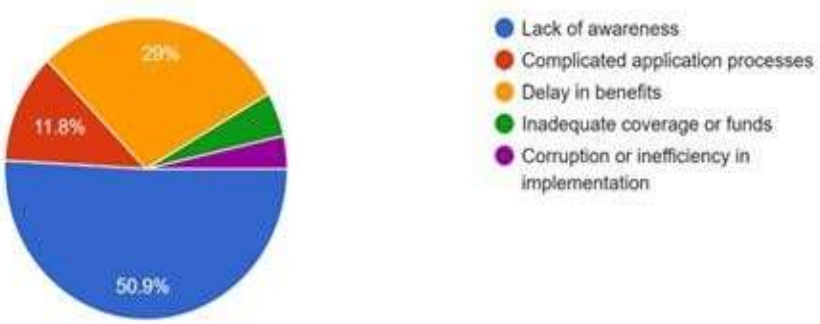


Table No. 04: Barriers preventing me from benefiting from these policies include lack of awareness, complex application processes, and limited accessibility.

Mean (μ)	**30.57**
Standard Deviation (σ)	**19.6**

Figure no.08 shows that farmers' responses highlight significant barriers to accessing government policies, with 50.9% citing a lack of awareness as the primary issue, followed by complex application processes (29%) and delays in benefits (11.8%). According to table no.04, a mean of 30.57 and a standard deviation of 19.6 indicate moderate to high variability, reflecting differing farmer experiences. While some navigate the system effectively, others struggle due to bureaucratic hurdles and limited outreach. Addressing these challenges through better information dissemination, simplified application procedures, and timely benefit distribution can improve accessibility. Enhancing transparency and efficiency in policy implementation is crucial for maximising farmer participation and support.

9. Local communities can play a crucial role in addressing climate change

Figure. No. 09

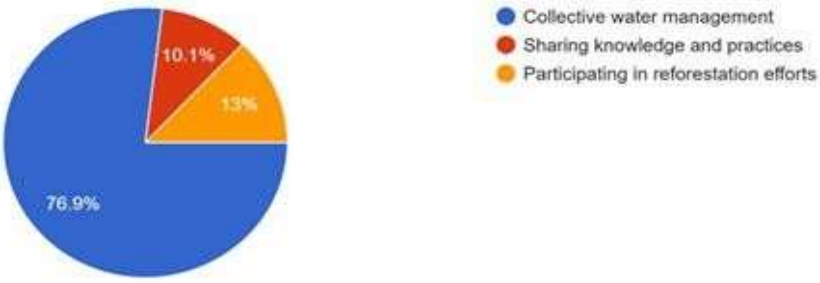


Table No. 05: Local communities can play a crucial role in addressing climate change

Mean (μ)	**33.33**
Standard Deviation (σ)	**37.74**

Figure no.09 shows that farmers' responses emphasise the significant role of local communities in climate action, with 76.9% prioritising collective water management. The minor focus on reforestation (13%) and knowledge-sharing (10.1%) suggests they may need further promotion while these efforts exist. According to table no.05, a high standard deviation (37.74) indicates diverse levels of participation, where some communities engage

actively while others contribute less. This variability highlights the need for targeted interventions, awareness programs, and policy support to encourage widespread participation. Strengthening local initiatives in water conservation, afforestation, and information exchange can improve climate resilience and ensure long-term sustainability in rural communities.

Hypothesis Testing

To validate the study's hypotheses, statistical tests were performed using survey responses (n= 169) from farmers in Marathwada. The hypotheses were tested using Chi-square tests and correlation analysis to examine relationships between policy awareness, adoption rates, socioeconomic factors, and access to information.

Hypothesis 1: Relationship between farmers' awareness of government policies and their adoption of climate adaptation programs

H_0: There is no significant relationship between farmers' awareness of government policies and their adoption of climate adaptation programs.

H_1: Higher awareness of government policies positively influences farmers' adoption of climate adaptation programs.

Statistical Test Used:

- **A Chi-square test for independence** assessed the association between **policy awareness (binary: aware/not aware)** and **adoption rates (binary: adopted/not adopted).**

Results:

 χ^2 (1, N = 169) = 15.62, p < 0.01

The results indicate a p-value of less than 0.01, demonstrating a statistically significant relationship between policy awareness and adoption. This suggests that farmers who were aware of government policies were significantly more likely to adopt climate adaptation programs than those who lacked awareness. The strong correlation highlights the critical role of information dissemination in policy effectiveness. Given these findings, the null hypothesis is rejected, confirming that higher awareness positively influences policy adoption.Therefore, enhancing outreach programs, providing accessible information, and improving farmer education on government schemes can significantly increase participation and adoption rates.

Hypothesis 2: Socio-Economic Factors and Policy Utilization

H_0: Socioeconomic constraints and limited access to information do not significantly impact farmers' ability to benefit from government policies.

H_1: Limited access to information and socio-economic constraints are significant barriers preventing farmers from fully benefiting from government policies.

Statistical Test Used:

- Pearson's correlation was used to examine relationships between education level, income, landholding size, and policy adoption rates.

Table No.06: Correlation Coefficient

Variable	Correlation Coefficient (r)	Significance (p-value)
Education Level & Policy Adoption	**0.52**	**p < 0.05**
Income Level & Policy Adoption	**0.61**	**p < 0.01**
Landholding Size & Policy Adoption	**0.47**	**p < 0.05**

Table no.06 shows results that indicate a moderate to strong positive correlation between education level ($r = 0.52$, $p < 0.05$), income level ($r = 0.61$, $p < 0.01$), and landholding size ($r = 0.47$, $p < 0.05$) with policy adoption. This suggests that farmers with higher education, better financial stability, and more extensive landholdings are more likely to access and adopt government schemes. The findings highlight the significant impact of socioeconomic factors on policy utilisation. Since lower-income and smallholder farmers face more significant

challenges in benefiting from government policies, targeted interventions such as financial assistance, training programs, and simplified access to schemes are necessary.

Conclusion:

Findings Analysis:

Survey data and pie chart visualisations provide insight into farmers' attitudes toward the effectiveness of government schemes in Marathwada. Studies on government policies show that PM-Kisan Samman Nidhi (PM-KISAN) is the most popular and used policy, as 97% of respondents availed of this scheme. In contrast, the adoption of the other policies, namely, the Pradhan Mantri Fasal Bima Yojana (PMFBY) and Soil Health Card, is low. This makes the need for such promotion and extension so that all kinds of farmers may be interested in these programs.

The role of communication remains significantly critical for a successful collaborative set-up. Nearly 82% of information comes from Agriculture Extension Officers and FPOs held highly by farmers. In contrast, other information dissemination channels like Gram Panchayat meetings/television, radio, / and social media receive very few mentions. The communication channels should be more relevant to reach an audience.

The data show that traditional knowledge is involved in analysing farmers' adaptation strategies for climate change, specifically in the quality of water and soil management practices. Such practices continue to have modern relevance and should be addressed for integration into government programs to improve local farming communities' effectiveness and climate resilience.

Recommendations:

1. Capacity Building and Responsibility Strengthening: To increase the use of various schemes such as the Soil Health Card Scheme and PMFBY, the alternative line of action is concerted efforts to enhance outreach and mobilise local support from remote areas. This could imply working closely with village pradhans, teachers, or community leaders close to rural dwellers.
2. Enhanced Communication Aids: The role of Extension Officers and Production Organizations must be reinforced urgently. Policies can be amended to involve young and urban farmers by deploying modern channels like the Internet and social media.
3. Inclusion of Traditional System: Governmental schemes should recognise traditional knowledge and agronomic practices and accommodate policies around them. Facilitating the exchange of traditional and scientific technologies will only induce sustainable agriculture.
4. Development of Community Participation: More opportunities need to be created for farmers to meet with local authorities and policymakers, including Gram Panchayat meetings and community forums. This will ensure that the Government's policies accommodate the peculiar needs and challenges of their farming community here in Marathwada.
5. Policy Evaluation and a Feedback Loop: Regular evaluation of the schemes by stakeholders involving farmers shall be the cornerstone to ensure the schemes keep working. This will keep policies responsive to the changing climate-related needs of the Marathwada farmer.

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