

Evaluating India's Climate Adaptation Policies: An in-Depth Qualitative Analysis of PMFBY, NAFCC, and the Soil Health Management Scheme in Enhancing Agricultural Resilience

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Abstract

India's agricultural industry is seriously threatened by climate change, which has an impact on crop yields, water availability, and rural livelihoods. To improve agricultural resilience, the Indian government has responded by enacting a number of adaptation measures. Important programs including the National Adaptation Fund for Climate Change (NAFCC), the Pradhan Mantri Fasal Bima Yojana (PMFBY), the Soil Wellness Scheme, and the encouragement of climate-resilient crop varieties are all critically examined in this paper. This article assesses how well these policies mitigate climate risks, ensure farmer sustainability, and promote long-term agricultural stability, based on official reports from the Ministry of Agriculture, NITI Aayog, IPCC, and FAO. To improve climate resilience in Indian agriculture, the findings draw attention to policy inadequacies, implementation issues, and the necessity of integrated adaptation methods. For researchers, politicians, and development professionals pursuing climate-adaptive and sustainable agricultural systems, this study offers insightful information.

Keywords: Climate Adaptation, Agricultural Resilience, Policy Effectiveness, Sustainable Farming, Climate Change Mitigation.

1. Introduction

Agriculture forms the backbone of India's economy, yet it is highly susceptible to the impacts of climate change, including erratic monsoons, droughts, and temperature fluctuations. To mitigate these effects, the Indian government has launched several adaptation programs aimed at enhancing the resilience of the agricultural sector.

This study focuses on three key schemes:

- **Pradhan Mantri Fasal Bima Yojana (PMFBY):** A crop insurance scheme providing financial support to farmers facing crop loss due to natural calamities.
- **National Adaptation Fund for Climate Change (NAFCC):** A fund supporting state-level adaptation projects aimed at reducing climate vulnerability.
- **Soil Health Management Scheme:** A program promoting sustainable soil management practices to improve crop productivity and soil health.
- education about the benefits

2. Objectives

The primary objectives of this study are:

- To evaluate the effectiveness of PMFBY, NAFCC, and the Soil Health Management Scheme in enhancing agricultural resilience.
- To analyse the implementation processes and challenges faced by these schemes.
- To identify areas for improvement and provide policy recommendations for better integration and efficiency.

3. Methodology

This study employs a qualitative approach, using official government reports, policy documents, and data from the Ministry of Agriculture, NITI Aayog, NABARD, and other relevant agencies. Diagrammatic representations, including flowcharts and tables, are used to illustrate the structure and impact of each scheme.

4. Scheme Analysis

Pradhan Mantri Fasal Bima Yojana (PMFBY): It aims to provide financial support to farmers facing crop losses due to unforeseen events, stabilize their

incomes, encourage continued engagement in agriculture, and promote the adoption of modern farming practices. The scheme is implemented through both public and private insurance companies, with farmers paying a nominal premium of 2% for Kharif crops, 1.5% for Rabi crops, and 5% for commercial crops. Claims are settled based on crop-cutting experiments and weather data, ensuring timely and accurate compensation for losses.

5. Results and Discussion

- PMFBY has significantly increased insurance coverage among farmers, covering around 30% of the gross cropped area.
- Challenges include delayed claim settlements, high administrative costs, and low awareness among farmers. (Figure 1)

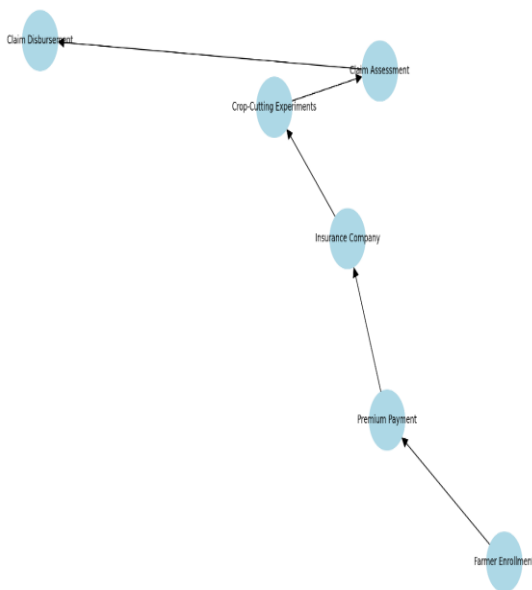


Figure 1 PMFBY Implementation Flowchart

The above figure illustrates the step-by-step process of PMFBY, starting from farmer enrolment, premium payments, and the role of insurance companies, leading to crop-cutting experiments, claim assessments, and final disbursement to farmers. (Table 1)

Table 1 PMFBY Coverage Data

Year	Farmers Covered (Lakhs)	Area Insured (Lakh Ha)	Claims Paid (₹ Crores)
2016-17	583.7	567.3	16,773
2017-18	533.0	508.3	22,177
2018-19	576.2	523.0	28,640
2019-20	608.8	494.8	25,409
2020-21	398.1	261.2	15,000

This table highlights the trends in PMFBY coverage, showing fluctuations in farmer participation, area insured, and claim settlements. (Figure 2)

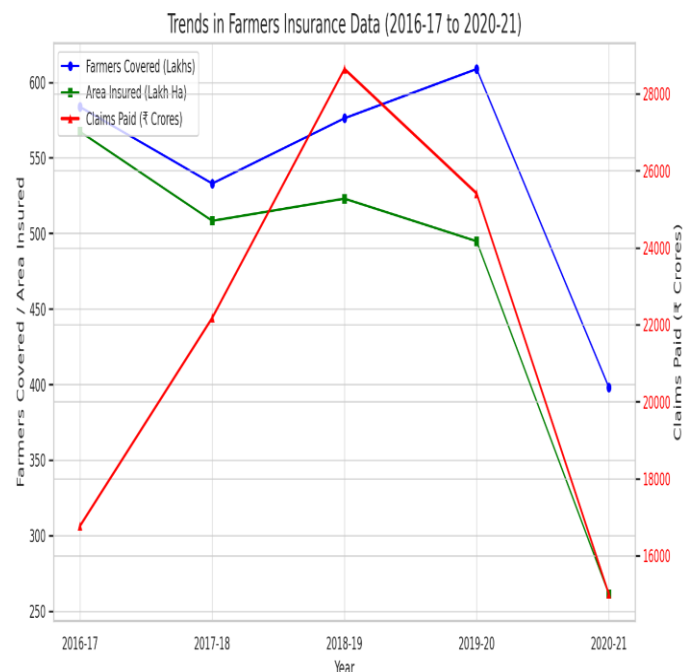


Figure 2 Trends in Farmers Insurance Data (2016-17 to 2020-21)

5.1. Key Trends and Insights

5.1.1. Fluctuating Coverage

- Farmers Covered and Area Insured followed a similar trend, peaking in 2019-20 and dropping sharply in 2020-21.
- This decline could be due to policy changes,

farmer dissatisfaction, or reduced awareness.

5.1.2. Claims Paid Peaks in 2018-19

Despite not having the highest number of farmers covered, 2018-19 saw the highest claims payout. This suggests either widespread crop losses or improved claim settlements that year. [1]

5.1.3. Decline in 2020-21

The sharp decline in coverage and claims paid in 2020-21 may be linked to COVID-19 disruptions, affecting both farming activities and access to insurance schemes.

5.1.4. Potential Implications

- **Policy Review:** The significant drop in 2020-21 calls for a policy review to understand why fewer farmers opted for insurance and to improve coverage in future years.
- **Risk Assessment:** The high payouts in years like 2018-19 indicate a need for better risk assessment and mitigation strategies to reduce crop losses.
- **Farmer Awareness:** Increasing farmer education about the benefits of crop insurance could help improve participation rates.

National Adaptation Fund for Climate Change (NAFCC): It aims to support adaptation projects in states and union territories, focusing on enhancing the resilience of vulnerable communities and ecosystems. The fund is implemented through NABARD, which serves as the National Implementing Entity. Financial assistance is disbursed based on project performance and adherence to NAFCC guidelines, ensuring effective utilization of resources for climate adaptation efforts. Results and Discussion: [2]

- 30 projects have been sanctioned across 27 states and UTs.
- Total funds released from 2015-2022 amount to over ₹500 crore.
- Challenges include bureaucratic delays, uneven fund distribution, and limited capacity at the state level. (Figure 3)

The above figure demonstrates the fund flow from the Ministry of Environment through NABARD to State Governments, which implement adaptation projects. Monitoring and evaluation ensure project compliance and effectiveness. (Table 2)

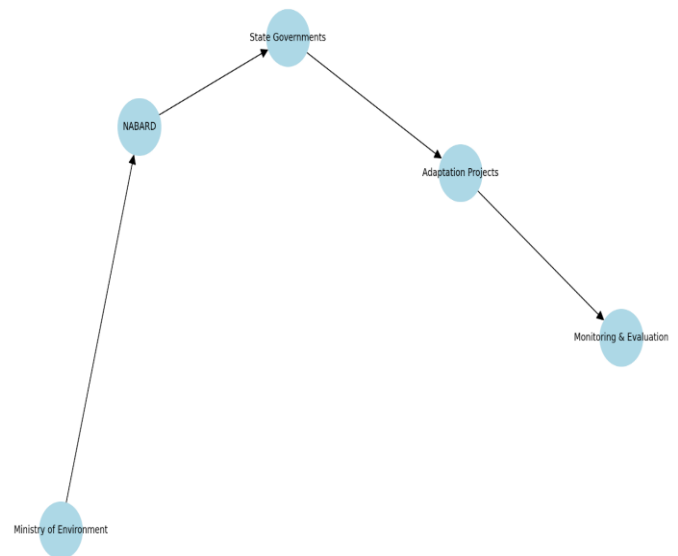


Figure 3 NAFCC Fund Flow

Table 2 NAFCC Fund Disbursement

Year	Funds Released (₹ Crores)
2015-16	118.38
2016-17	94.00
2017-18	115.36
2018-19	109.50
2019-20	33.51
2020-21	42.94
2021-22	27.76

The table reflects the annual disbursement of funds under NAFCC, revealing variations in fund allocation over the years. (Figure 4)

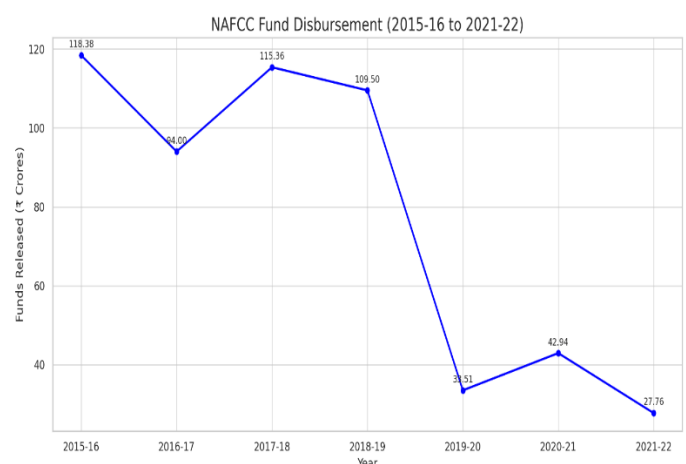


Figure 4 NAFCC Fund Disbursement (2015-16 to 2021-22)

5.2. Key Findings

5.2.1.Strong Initial Momentum

The program had significant momentum in the first few years, with consistent high funding that likely supported a broad range of adaptation projects.

5.2.2.Sharp Mid-Program Drop

The sharp decline post-2018-19 indicates potential bottlenecks in project implementation or administrative hurdles.

5.2.3.Need for Policy Review

- The consistent decline in fund disbursement points to the need for a policy review to assess:
- Effectiveness of existing projects.
- Challenges faced in fund utilization.
- Administrative or procedural delays in fund release.

5.2.4.Impact on Climate Adaptation Goals

Reduced disbursement likely hindered the implementation of critical adaptation projects, potentially affecting communities vulnerable to climate change. [3]

5.2.5.Future Focus Areas

- Streamlining approval processes.
- Enhancing monitoring and evaluation to ensure optimal fund utilization.
- Building capacity at the state and district levels to implement climate adaptation projects efficiently.

The data on NAFCC fund disbursement reveals an initial phase of strong funding followed by a significant decline. This trend suggests that while the program began with considerable momentum, challenges in fund utilization or project implementation may have curtailed its progress. A comprehensive review and targeted policy interventions are essential to revitalize the program and ensure it continues to meet its objectives of supporting climate adaptation in India. [4]

Soil Health Management Scheme: The Soil Health Management Scheme aims to promote sustainable soil management practices and enhance crop productivity through balanced nutrient use. To achieve these objectives, the scheme includes the distribution of Soil Health Cards, which provide detailed information on nutrient status and fertilizer

recommendations to farmers. Additionally, soil testing laboratories are being established across India to support accurate soil analysis and informed nutrient management

- Over 23 crore Soil Health Cards have been distributed. (Table 3)
- Reported benefits include a 5-6% increase in crop yields and a reduction in fertilizer use by 8-10%.
- Challenges include uneven implementation, limited farmer outreach, and technological barriers. (Figure 4)

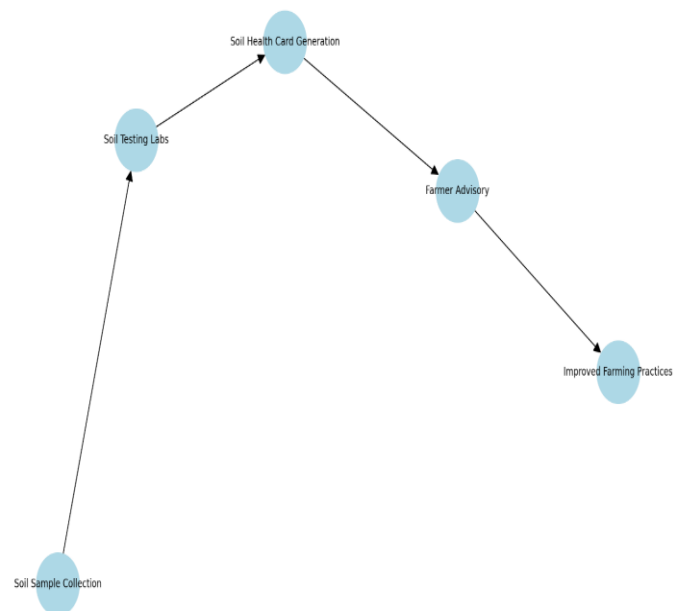


Figure 4 Soil Health Management Process

Table 3 Soil Health Card Distribution

Year	Soil Health Cards Distributed (Crores)	Increase in Crop Yield (%)
2015-16	2.53	5
2016-17	3.74	6
2017-18	4.65	6.5
2018-19	5.21	7
2019-20	3.88	5.5
2020-21	3.57	6

This flowchart outlines the process from soil sample collection to testing in labs, generation of Soil Health Cards, and advisory services provided to farmers, ultimately leading to improved farming practices. This table illustrates the distribution of Soil Health Cards and the corresponding improvements in crop yield. [5]

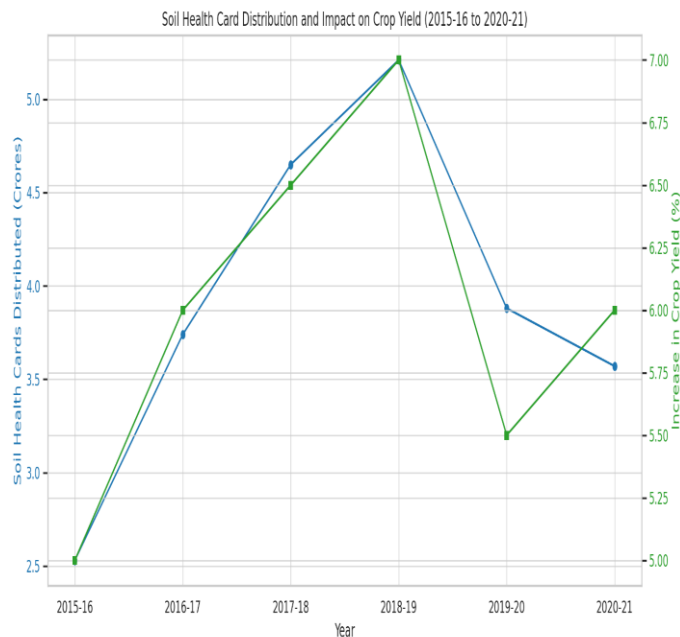


Figure 5 Soil health Card Distribution and Impact on crop yield (2015-16 to 2020-21)

5.3. Key Trends Identified

5.3.1. Growth in Soil Health Card Distribution (2015-16 to 2018-19)

- The number of SHCs distributed increased consistently from 2.53 crores in 2015-16 to a peak of 5.21 crores in 2018-19.
- This upward trend indicates an aggressive outreach effort to ensure that farmers receive personalized soil health data to improve farming practices. [6]

5.3.2. Corresponding Increase in Crop Yield

- There was a steady improvement in crop yields, rising from 5% in 2015-16 to 7% in 2018-19, corresponding with the increased SHC distribution.
- This suggests that farmers who received

SHCs were adopting better nutrient management practices, leading to enhanced productivity.

5.3.3. Decline Post 2018-19

- Both SHC distribution and yield improvements experienced a decline after 2018-19:
- SHC distribution fell to 3.88 crores in 2019-20 and 3.57 crores in 2020-21.
- Crop yield improvements also dipped to 5.5% in 2019-20 before slightly recovering to 6% in 2020-21.

5.3.4. Potential Reasons for the Decline

- Saturation effect, where most farmers had already received SHCs in earlier years.
- Administrative delays or challenges in soil testing and card distribution.
- Possible impact of external factors like adverse weather conditions or the COVID-19 pandemic, affecting outreach programs and agricultural productivity. [7]

5.4. Discussion

5.4.1. Integrated Impact on Agricultural Resilience

The combined impact of these schemes has enhanced agricultural resilience by reducing income variability, improving soil health, and providing financial buffers against crop loss. However, a lack of integration among the schemes limits their overall effectiveness. The evaluation of India's climate adaptation policies, particularly the Pradhan Mantri Fasal Bima Yojana (PMFBY), National Adaptation Fund for Climate Change (NAFCC), and the Soil Health Management Scheme, reveals a mixed performance in enhancing agricultural resilience. PMFBY has been pivotal in expanding crop insurance coverage, insuring about 30% of the gross cropped area. However, persistent challenges such as delayed claim settlements, high administrative costs, and limited farmer awareness have undermined its potential impact. The significant fluctuations in coverage and claims, especially the decline in 2020-21, highlight the need for policy refinement and stronger implementation frameworks. NAFCC has supported 30 adaptation projects across 27 states and union territories, with a substantial fund allocation

exceeding ₹500 crore from 2015-2022. Despite its initial momentum, the sharp decline in fund disbursements after 2018-19 indicates administrative bottlenecks and challenges in project execution. The uneven distribution of funds and bureaucratic delays have affected the timely implementation of critical adaptation initiatives, limiting the fund's overall impact on vulnerable communities and ecosystems. The Soil Health Management Scheme has made notable progress by distributing over 23 crore Soil Health Cards, leading to a 5-6% increase in crop yields and an 8-10% reduction in fertilizer use. Nonetheless, the scheme faces implementation challenges such as inconsistent outreach, technological barriers, and varying farmer adoption rates. The decline in card distribution and crop yield improvements post-2018-19 suggests the need for renewed focus on farmer engagement and consistent monitoring. [8]

Policy Recommendations: To enhance the effectiveness of India's climate adaptation policies, the following recommendations are proposed:

5.4.2.Strengthen PMFBY Implementation

- Introduce robust monitoring mechanisms to ensure timely claim settlements.
- Simplify claim procedures and reduce administrative costs to improve efficiency.
- Launch targeted awareness campaigns to educate farmers on the benefits and processes of crop insurance.

5.4.3.Revitalize NAFCC Funding and Execution

- Streamline fund disbursement processes to minimize bureaucratic delays.
- Establish state-level capacity-building programs to enhance project implementation efficiency.
- Introduce a comprehensive monitoring and evaluation framework to ensure accountability and optimal fund utilization.

5.4.4.Optimize Soil Health Management Scheme

- Expand the network of soil testing laboratories to increase coverage and reduce

testing time.

- Strengthen farmer outreach programs to ensure widespread adoption of soil health practices.
- Integrate advanced technologies for real-time soil monitoring and tailored nutrient management advice.

5.4.5.Promote Integrated Adaptation Strategies

- Encourage synergy among PMFBY, NAFCC, and Soil Health Management Scheme to create a holistic adaptation framework.
- Facilitate cross-sector collaboration among government agencies, research institutions, and local communities for knowledge sharing and innovation.

5.4.6.Enhance Farmer-Centric Policies

- Prioritize the inclusion of marginalized and smallholder farmers in adaptation initiatives.
- Develop financial literacy programs to empower farmers in managing insurance, credit, and subsidies effectively.

Conclusion

India's approach to climate adaptation in agriculture through PMFBY, NAFCC, and the Soil Health Management Scheme demonstrates commendable efforts in enhancing resilience but also exposes critical gaps in implementation and policy design. While these schemes have yielded tangible benefits, persistent challenges such as administrative inefficiencies, inconsistent outreach, and limited farmer engagement hinder their full potential. Addressing these challenges through targeted policy reforms, streamlined processes, and integrated adaptation strategies is essential for building a more resilient and sustainable agricultural sector. A farmer-centric approach, underpinned by robust monitoring and cross-sector collaboration, will be key to ensuring long-term climate resilience and food security in India.

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