

Impact of Climate Change on Farm Credit

Hitanshi Kalra

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Abstract

Climate change is increasingly recognized as a critical factor influencing agricultural systems worldwide. In India, the interplay between climate variability and farm credit is profound, as agriculture remains heavily reliant on weather patterns and natural resources. This paper explores the multifaceted impact of climate change on the demand and supply of farm credit, highlighting key challenges faced by farmers, financial institutions, and policymakers. Using case studies, field surveys, and secondary data analysis, the research examines how climatic risks such as erratic rainfall, droughts, floods, and heatwaves amplify financial vulnerabilities among farmers, leading to increased loan defaults and credit constraints. It also assesses the role of various schemes in mitigating climate-induced risks through investments in adaptive technologies and resilient farming practices. The findings reveal a growing need for tailored credit products, risk-sharing mechanisms like insurance-linked loans, and enhanced institutional frameworks to address climate-induced challenges in farm credit delivery. The paper concludes with recommendations for policymakers to align credit policies with climate resilience goals, ensuring financial inclusion and sustainability in the agricultural sector amidst evolving climate risks.

Literature Review

Climate change has had a significant impact on agricultural dynamics, especially on farm banking availability and demand. Farmers now face greater risks due to rising temperatures, unpredictable rainfall patterns, and a rise in the frequency of catastrophic weather occurrences, which calls for strong financial support systems.

The Pradhan Mantri Fasal Bima Yojana's contribution to climate risk mitigation through crop insurance is highlighted in PMFBY Reports (2018–2022). According to these assessments, states like Maharashtra and Bihar have made important claims that highlight how prone they are to drought and flooding. However, as the 2023 claims data shows, issues still exist, including inadequate coverage and delayed settlements. A Bihar study highlights how climate-related uncertainties raise credit demand and put farmers at danger of debt traps. It implies that farmers' financial constraints are exacerbated by their frequent reliance on unofficial sources due to limited access to institutional financing.

In "How India Can Minimize Climate Risk in Agriculture," Ashok Gulati emphasizes the importance of improved irrigation systems, diversified planting patterns, and integrating insurance programs with technology. He supports governmental initiatives that combine financial tools like providing climate adaptation plans.

Narendra Singh Tomar's observations on Indian agriculture stress how crucial it is to increase institutional finance penetration and use technology to build up farming's resistance to climate

shocks. Writings by P. Sainath explore rural suffering and the socioeconomic hardships faced by farmers. He calls for reforms for fair access and criticizes policies that ignore systemic problems in farm credit systems.

There are significant shortfalls in the effectiveness and outreach of PMFBY, according to ResearchGate papers on its implementation. Among the suggestions are encouraging public-private collaborations and increasing the openness of claim settlements.

These findings make it obvious that climate change demands new finance arrangements suited to farmers' needs. Sustainable agricultural development depends on adopting climate-resilient techniques, increasing insurance effectiveness, and granting timely institutional credit. In the face of growing climate uncertainty, these steps allow farmers to secure their livelihoods while reducing risks.

Introduction

One of the biggest worldwide issues of the twenty-first century is climate change, which has a big impact on rural livelihoods and agriculture. Traditional farming methods have been troubled by rising temperatures, unpredictable rainfall, catastrophic weather events, and changing climatic patterns, especially in emerging nations like India, where agriculture employs more than 50% of the workforce and is the backbone of the economy. Crop yields, water availability, and soil health are all severely impacted by these climate disturbances, making farmers who depend largely on natural resources for their livelihoods even more insecure.

Farm credit policies and programs like the Pradhan Mantri Fasal Bima Yojana have become more and more important in the face of these difficulties. In addition to improving agricultural output, these also act as a safety net for finances in difficult times. Climate hazards, including heat waves, floods, and droughts, make farmers more dependent on loans for adaptation and recovery while further raising the likelihood of loan defaults. Given that India's agriculture is primarily rain-fed and highly sensitive to changes in the weather, the relationship between policies and programs and climate change is particularly clear there. Credit requirements for crop diversification, irrigation infrastructure, and climate-resilient farming practices have increased as a result of the rise in unfavorable weather events. Small and marginal farmers have less access to loans and harsher terms as a result of financial institutions' difficulties in determining and managing risks.

The following paper aims to look into the complex connection between agricultural financing in India and climate change. It looks at how the demand for credit, farmers' ability to repay loans, and financial institutions' lending practices have been affected by climatic variability. The study also

identifies gaps in current frameworks and policies and discusses how credit can support climate-resilient farming practices. By resolving these important problems, the study hopes to offer stakeholders and policymakers practical advice on how to create a farm credit system that is resilient, inclusive, and flexible enough to meet the demands of climate change.

The research underscores how essential it is to incorporate climate change considerations into the farm credit landscape, acknowledging that a well-crafted credit policy may be a crucial instrument for risk mitigation and resilience development in the agriculture industry. Accessible and sustainable farm financing is not only financially necessary but also vital for food security and rural development as climate change continues to alter the socio economic landscape of rural India.

What is Climate Change?

Climate change is a term used to describe ongoing shifts in temperature and weather patterns. Massive volcanic eruptions or variations in the sun's energy could be the source of these shifts. When fossil fuels are heated up, greenhouse gases get released into the atmosphere, these pollutants surround the earth like a blanket and absorb solar heat, raising global temperatures.,

Weather and climate have significant impacts on agriculture. It is also heavily reliant on land, water, and other naturally existing resources, all of which are affected by climate. In certain regions, climate change (temperature, precipitation, and frost frequency) could make it possible to grow a wider variety of crops or expand the growing season, but it will also have an impact on agricultural practices in other regions. Drought, heatwaves, and flooding are some of the unexpected consequences of climate change, which are occurring sooner than ever before.

Impact On Farmers and Agriculture

Changes in climate have the potential to limit food access, availability, and quality.

The overall result of these climate effects is likely to be negative (droughts leading to lower crop yields or crop failures, for example), while rarely they might be favourable (warmer springs, longer growing seasons). Climate change may affect agriculture at both local and regional scales. Key impacts are described in this section.

1. Changes in Agricultural Productivity

Climate change may affect the conditions better or worse for growing crops in different places. For instance, longer growing seasons are a result of variations in temperature, precipitation, and frost-free days in almost every state. For food production, an extended growing season may bring both advantages and disadvantages. While some farmers could be able to plant more crop cycles or long-maturing crops, others might need to provide more irrigation during a longer, hotter growing season. Additionally, plants, trees, and crops can be destroyed by air pollution. For example, plants

that get high levels of ground-level ozone absorb less photosynthesis, develop more slowly, and become more prone to disease.

2. Impacts to Soil and Water Resources

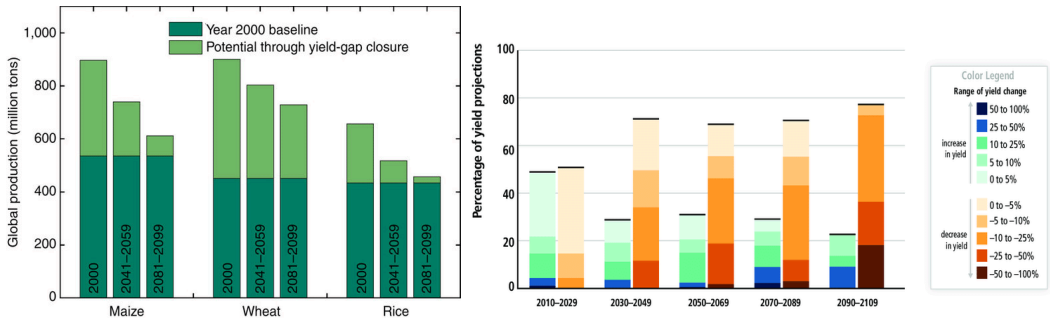
It is expected that climate change would lead to an increase in the rate of heavy rains . This might be harmful to crops as it may weaken soil and deplete nutrients. Additionally, agricultural run off into lakes, streams, and oceans can be increased by heavy rainfall. Water quality may be harmed by this waste. Drainage can cause water bodies' oxygen levels to drop when combined with the rising water temperatures brought on by climate change.

3. Health Challenges to Agricultural Workers and Livestock

Several health risks due to climate change affect agricultural labourers. These include being exposed to heat and other harsh weather conditions, being around more pests and hence given to more pesticides, being around disease-carrying pests like ticks and mosquitoes, and having worse air quality. Farmers choose varieties that best fit the climate where they live. They will have to reconsider some of their substitutes if these conditions change over the years to come. This may require making new capital investments, looking for new markets, or learning up new skills.

4. Food security

Food insecurity will likely increase as a result of decreasing agricultural output and the abrupt loss of crops and livestock, which will probably have an ongoing impact on food costs.



In absence of adoption of adaptation measures, rainfed rice yields in India are projected to reduce by 20% in 2050 and 47% in 2080 scenarios while, irrigated rice yields are projected to reduce by 3.5% in 2050 and 5% in 2080 scenarios. Climate change is projected to reduce wheat yield by 19.3% in 2050 and 40% in 2080 scenarios towards the end of the century with significant spatial and

temporal variations. Climate change is projected to reduce the *kharif* maize yields by 18 and 23% in 2050 and 2080 scenarios, respectively.¹

Farm Credit

The term agricultural credit refers to one of several credit vehicles used to finance agricultural transactions. These vehicles include banker's acceptances, notes, bills of exchange, and loans. With the help of these financing alternatives, farmers can purchase equipment, plant, harvest, market, and carry out other tasks that are essential to maintaining their farms. It has been customised to meet their particular financial demands.

Types of agricultural credit

Agricultural credit in India can be divided into three main categories based on the period and goal of the nation's farmers' credit requirements:

- **Short term credit:** Indian farmers need capital in order to meet their short-term expenses, such as buying seeds, fertiliser, paying hired labourers' salaries, etc., for periods shorter than 15 months. Usually, these loans are paid immediately after harvest. These loans are known as short-term credit .
- **Medium-term credit:** This form of credit is needed by farmers for the purchase of livestock, pumping sets, other agricultural implements, etc., and is required for a medium-term period ranging between 15 months and 5 years.
- **Long term credit:** In order to purchase more land or to do any long-term improvements to their property, such as digging wells, reclaiming land, growing horticulture, etc., farmers also need financing for a duration longer than five years. As a result, long-term lending demands a sufficient period for loan payback.

Increased demand for Farm Credit

In 2018 alone, India witnessed several major farmer protests. These demonstrations were a powerful way for the average Indian farmer to voice their sorrow over the escalating agrarian crisis in the rural economy. The states most suffering from this issue from 2010 to 2016 included Telangana, Andhra Pradesh, Karnataka, Chhattisgarh, and Madhya Pradesh, but Maharashtra has

¹ <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=2037408®=3&lang=1>

constantly had the greatest number of suicides. Low agricultural growth implies lower salaries and productivity for individuals working in agriculture. Agriculture's share of India's GDP has gradually decreased since independence.

The following are the main reasons behind this ongoing agrarian crisis:

1. strong reliance on monsoons and the incapacity to mitigate the predictability of nature's moods because of inadequate irrigation infrastructure, among other things;
2. a lack of access to appropriate technology;
3. irregularities and inefficiencies in the marketing ecosystems and agricultural markets; and

(4) the lack of reasonably priced institutional finance.

- Percentage of Households that Faced Various Forms of Distress Events

Distress Event	Percentage of households that faced the event (%)
Crop failure due to excessive, very low or untimely rainfall	53.8
Sudden decline in productivity of crops due to pest infestation, etc	27.6
Sudden fall in market price of crops	18.2
Loss of livestock due to flood, diseases, etc	9.8

Agricultural financing and agricultural growth are closely linked to one another. In order to start and maintain a healthy agricultural cycle based on high-quality inputs like seeds, fertilizers, machinery, and equipment, and an adequate supply of water and electricity, a farmer requires access to cost-effective institutional finance. Credit contributes to other critical agricultural activities that are essential to production, like marketing, warehousing, storage, and transportation. In times of difficulties, agricultural finance is crucial for supplying necessities. Farmers must be able to afford in order to withstand the unexpected cost of crop failure brought on by factors like drought, pest infestation, or price crashes.

How Credit Demand Changes

Due to variations in temperature, soil types, agricultural practices, and socioeconomic circumstances, the need for farm credit varies greatly between crops and areas. Both short-term and long-term borrowing are impacted by these factors, which also affect farmers' loan demands.

1. Climate and Weather Patterns- Increased demand for short-term loans as a result of recurring crop failures brought on by floods, droughts, and erratic monsoons.
2. Types of crops cultivated like commercial and subsistence- Commercial crops usually have higher loan demand because they require large input, labour, and machinery investments. Farmers also depend more on loans to manage financial risks because they are prone to insect attacks, market fluctuations, and climate change. Farmers who grow subsistence crops have low credit requirements because these crops are of low-input and low cost. However, the need for credit for fertiliser, seeds, or irrigation may increase in areas where these crops are being impacted by the weather.
3. Access to Irrigation-The need to invest in high-yield crops, fertilisers, and farm equipment in order to maximise production frequently drives loan demand in areas with significant irrigation systems.

There is a substantial crop-dependent and region-specific demand for farm loans. Climate, crop type, irrigation availability, and farmers' socioeconomic backgrounds are some of the factors which heavily influence the credit requirements. Farmers in drought-prone areas like Rajasthan and Maharashtra deal with erratic weather patterns and regular crop failures, which raises the need for short-term loans. On the other hand, the demand for the funding is mostly driven by the need to finance infrastructure, mechanisation, and high-yield inputs in areas like Punjab and Haryana that are well-irrigated and have advanced agriculture.

Pradhan Mantri Fasal Bima Yojana

The Pradhan Mantri Fasal Bima Yojana was introduced in 2016 with the aim of supporting farmers by providing a comprehensive and cost-effective crop risk insurance plan. PMFBY works on the **One Nation, One Crop, One Premium, and** through this, it aims to provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crops as a result of natural calamities, pests, and diseases. The premium cost is 2% for Kharif crops, 1.5% for Rabi crops, and 5% for annual commercial and horticultural crops. The program provides a broad insurance policy against crop failure with the goal of minimizing loss and stabilizing farmers' income. Under this scheme, a broad basket of horticulture crops like cereals, oilseeds, and pulses are also included.

Following stages of the crop risks leading to crop loss are covered under the Scheme:

- Prevented Sowing/Planting/Germination Risk:
- Standing Crop (Sowing to Harvesting)
- Post-Harvest Losses
- Localised Calamities
- Add-on coverage for crop loss due to attack by wild animal

Performance of PMFBY (2018 - 2021)

According to PMFBY time series data from 2018 to 2021, farmers' involvement in the program is declining during both the Kharif and Rabi seasons, as the graph illustrates. This falls against the plan's first projections when it was introduced in 2016. It had estimated that farmers' engagement could have evolved over time, rationalising the rate at which premium prices were discovered. Year-wise trend of farmers' participation.

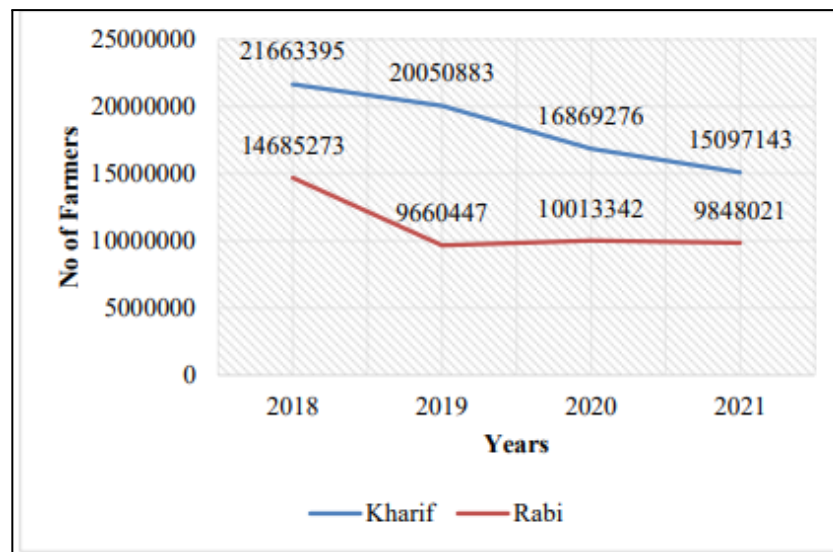


Figure 1 : Year wise trends of farmers participation

In figure no. 1, throughout 2018 and 2021, there is a declining tendency in the states'/UTs' and districts' involvement in PMFBY for both the Kharif and Rabi seasons. This suggests that there are immediate challenges for the states and insurance companies (ICs) in putting the plan into action.

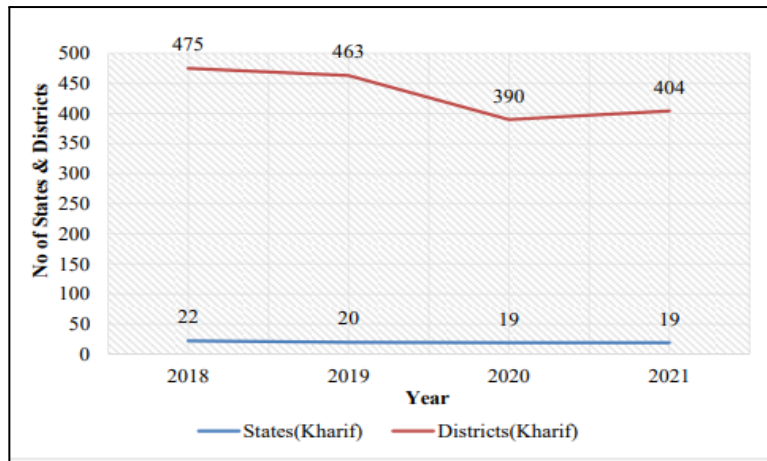


Figure 2: Participating number of states & districts in PMFBY (Kharif)

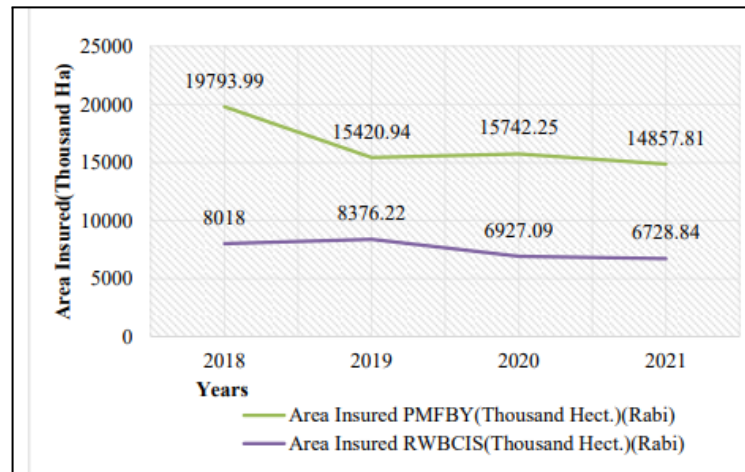


Figure 3: Extent of area insured under PMFBY & RWBCIS (Kharif)

According to figure no. 3, the area covered by PMFBY and RWBCIS, there is a downward trend for both of the main crop seasons. The decreasing patterns, which include i) coverage of states and districts and ii) coverage of areas insured in Kharif and Rabi, demonstrate the difficulties in achieving the beneficial goals of PMFBY 1.0 and PMFBY 2.0.

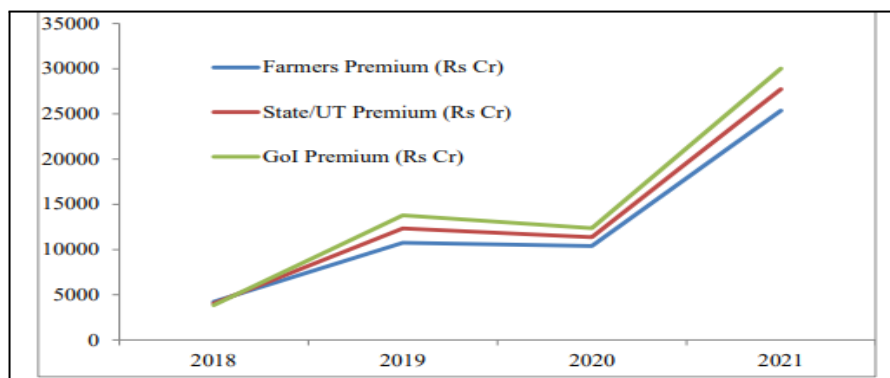


Table 4: Trend of premium contribution

In the figure no. 4 The analysis of the premium contributions made by the three (3) stakeholders—farmers, states/union territories, and the centre—reveals that they went up in 2018–19 relative to the prior years, fell marginally in 2019–2020, and increased significantly in 2020–21. Additionally, the next fig shows the steady rise in the premium outgo (gross premium) from 2016–17 to 2019–20, which appears to have levelled off in 2020–21. From 2016–17 to 2018–19, the number of authorised claims increased; after that, it decreased in 2019–20 and 2020–21. It is crucial to examine the decline in the ratio of approved claims to the overall amount of premiums paid. Trend of premium contribution.

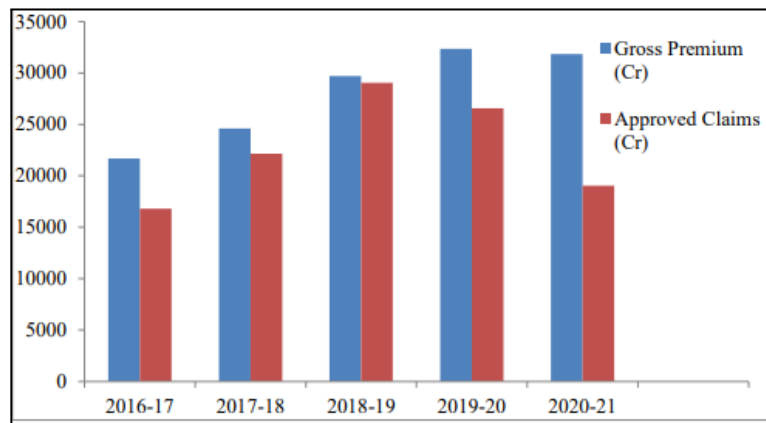


Figure 5: Trend of insurance claims vis-à-vis premium amount

The graph mentioned above highlights the elements that have changed since the program's implementation in 2016 and have hampered its development to include more states, union territories, and districts; more crops and land in both the Kharif and Rabi seasons; more farmers. This needs to be examined because it is occurring even though farmers are required to pay modest premium rates that are consistent across all crops in a season. Due to the growing and significant premium share relative to insurance claims, many states are also gradually withdrawing from the program. The fact that significant claims have only been raised and settled in a small number of states and districts, leaving other individuals feeling discriminated against and helpless, is one especially concerning aspect. In light of this, it is fundamental that stakeholders' concerns be resolved as soon as possible by clarifying the terms of the government's premium subsidy or concession to farmers under PMFBY. Adopting scientific analysis of multiple layers of information is necessary to address all issues involving stakeholders (farmers, insurance companies, banks, states, and central government departments), crop cutting matters, localised loss claims, technology use, transparency, time-bound grievance redressal, and claim payment. A more equitable crop insurance program can be designed with the aid of an analytics-based interpretation alone. The analysis

highlights several critical challenges and disparities in the performance of the crop insurance scheme, particularly in the distribution of benefits and premium subsidies among states and districts.

Key Observation-

1. Premiums and Subsidies:

The scheme's overall claim ratio from Kharif 2016 to Rabi 2018–19 was over 80%. With higher rates in Tamil Nadu (20%), Karnataka (18%), and Gujarat (22%), the average premium realisation by state was 12%. This implies a substantial financial burden on these states. Several states, like Madhya Pradesh, Rajasthan, Gujarat, and Maharashtra, receive over 60% of the overall central subsidy. For instance, Gujarat accounts for 6% of the overall sum insured but receives 12% of the subsidy, whereas Maharashtra, which accounts for 12% of the total sum covered, shares 22% of the subsidy. While Maharashtra has the largest percentage of non-loanee farmers (62%), Rajasthan and Madhya Pradesh account for more than 53% of loanee farmers. States that have wiped out farmer premiums, such as West Bengal and Jharkhand, have larger percentages of non-loanee farmers—11% and 6%, respectively.²

2. Claims and Regional Disparities

Among 27 states, eight—including Tamil Nadu, Chhattisgarh, and Haryana—had claim ratios higher than 100%, which equates to 20% of the sum insured. With a benefit coverage percentage of 91% and an average claim size of ₹27,429, Tamil Nadu is in first place. High claim sizes and larger landholdings are correlated with this tendency. Of the 620 districts, 135 record loss ratios more than 100%; these districts make up 25% of the insured area but get 51% of all claims. Fifty important districts, which made up 18% of the insured territory, had a loss ratio of 179% and 41% of claim payouts. The significant percentage of non-loanee farmers in several of these areas suggests that the advantages are concentrated in the region.

3. Snapshot of Premium Rates

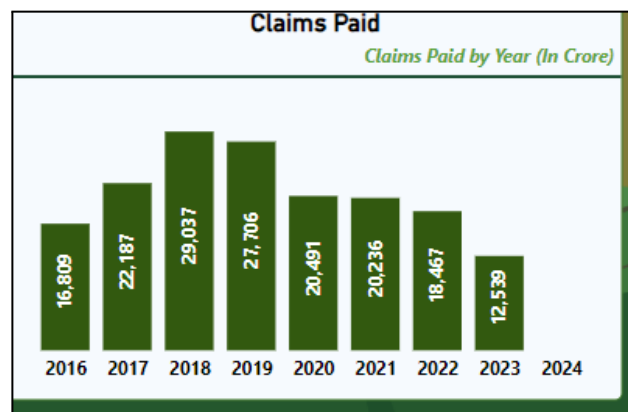
A total of 29% of gross premiums during the Kharif season came from 14.83% of the insured area, whereas 23% came from 6.77% of the insured area during the Rabi season. A major contribution during the Rabi season was Tamil Nadu.

4. Implications and Challenges

According to the data, certain states and districts are disproportionately benefited in the unfair distribution of subsidies and benefits. This calls into question the scheme's implementation's

² https://agriwelfare.gov.in/Documents/annual_report_english_2022_23.pdf

fairness and equity. Inconsistencies and possible exploitation are shown by certain regions' high premium rates and claim ratios. Despite making up a smaller fraction of the insured territory, states like Gujarat and Maharashtra disproportionately receive more claims and payments. Districts with high rewards have an excessive number of non-loanee farmers, which suggests that targeting and implementation are inadequate.



The data in the image shows the "Claims Paid" under the Pradhan Mantri Fasal Bima Yojana (PMFBY) from 2016 to 2024 in crore rupees. Here's a breakdown of the observed trends and potential reasons behind them:

1. Trends in Claims Paid:

- **2016 to 2019:** There is a steady increase in claims paid, peaking at 29,037 crore in 2018, before slightly decreasing to 27,706 crore in 2019.
- **2020 to 2021:** A noticeable decline is observed, with claims paid dropping to 20,491 crore in 2020 and remaining similar at 20,236 crore in 2021.
- **2022 to 2024:** The claims paid decrease further, with a significant drop to 18,467 crore in 2022, 12,539 crore in 2023, and potentially lower in 2024.

2. Possible Reasons for the Decline in Claims Paid:

It's possible that advancements in crop varieties, climate-resilient infrastructure, and agricultural methods reduced crop losses over time, which led to lower insurance claims. More precise targeting and more stringent eligibility requirements for claims were among the changes made to the

PMFBY. As a result, fewer but more legitimate claims would be handled. Even if applications stayed stable, claim disbursements may eventually decline if there were delays or denials in the claim processing procedure. The overall sum paid out in claims may have fallen if there had been fewer cases of crop loss due to favourable weather in some years. Claims paid are declining even while the sum insured and applications insured have either stayed the same or risen.

Various Gaps identified in Scheme implementation:

In the majority of states, insurance firms have not played a significant role in raising awareness or developing skills. Until acceptable claims are resolved, farmers are not notified when their applications are denied. The scheme's acceptance among SC/ST/women and extremely poor farmers is not well documented. Because several states, like West Bengal and Bihar, choose not to participate in the program, enrollment and the region covered have decreased.

Farmers have fallen behind on their agricultural debts as a result of states' announcement of farm loan waiver programs, which further disqualifies them from coverage under the loanee farmer category of crop insurance. The total amount of farmers insured fell from 5.72 crore in 2016–17 to Rs. 4.99 crore in 2017–18. This drop fell under the category of mandatory loanees. More than 69 lakh farmers are no longer eligible for loans after the two biggest states, Maharashtra and Uttar Pradesh, declared loan waivers. The North Eastern States have yet to fully benefit from the program.

What could be done to improve-

In addition to developing the crop calendar, it is considered necessary to carry out crop suitability studies throughout the selected areas. Cropping patterns can be encouraged according to area suitability and eventually decrease the potential losses. Additionally, this can lead to more efficient agricultural risk management, which is becoming more and more of a concern due to climate change. Due to agro-ecologically sound production systems, there is room to reduce production risks and achieve a more stable state of income returns. It is essential to implement a risk management strategy that stops risks from arising. The other issues that required attention were yield variability, the kinds of crops covered by insurance, and the data sets that the states are evaluating to determine whether a crop qualifies as major or merits notice for PMFBY coverage.

Overall Link Between Climate Change and PMFBY Trends

The consequences of climate change, which is having a major impact on Indian agriculture, are strongly related to the patterns in the PMFBY data.

A vital safety net that helps farmers deal with the financial effects of climate change is insurance. Particularly in recent years, the number of covered applications and area has increased, suggesting that more farmers are using insurance as a vital risk management tool to shield themselves from the growing probability of income shocks. Farmers are growing increasingly conscious of the necessity of safeguarding themselves against climate-related hazards as climate change continues to disrupt conventional farming methods.

More farmers are looking for insurance to protect their revenue and tackle possible crop losses as climate threats increase. Farmers are more likely to participate in insurance programs like PMFBY when they are faced with more climate-related hazards because they are more proactive in seeking financial protection.

Farmers are more likely to suffer crop failure due to greater monsoon unpredictability, which makes them insure their crops in order to handle the financial weight of possible losses. Farmers are increasingly taking part in insurance programs to protect themselves from the risk of poor harvests as a result of these rising temperatures, which are harmful to crop productivity. Insurance offers a crucial safety net, enabling farmers to cope with the financial impacts of climate change. The increase in insured applications and area, especially in recent years, indicates that more farmers are turning to insurance as a necessary risk management tool to protect themselves from the increasing likelihood of income shocks. As climate change continues to destabilise traditional agricultural practices, farmers are becoming more aware of the need for protection against climate-related risks.

North Eastern States

In India, agricultural lending has been crucial for sustaining farm productivity. One of the main sectors that contributes most to the GDP is agriculture, followed by forestry and fishing.

Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura are the eight Northeastern states that are expanding quickly, becoming less dependent on agriculture, and generally doing well. The agriculture and associated sectors need to receive the greatest amount of support if the North Eastern Region is to expand and become competitive with the rest of the nation. Even though the Twelfth Five Year Plan is almost coming to an end, the region still lags behind the rest of the nation in terms of agricultural productivity, cropping intensity, irrigation coverage, fertiliser and pesticide application, credit flow, organised marketing facilities, building enough go-downs and warehouses, crop insurance, and the production of large amounts of value-added products, among other areas. Furthermore, the current state of the processing of different agricultural crops to increase their worth is likewise unsatisfactory.

For this reason, NEC aims to allocate the greatest amount of funding possible for the region's overall agricultural development and modernization. The distribution of resources, infrastructure,

credit flow, industrialization, and other socioeconomic factors vary greatly between the Northeastern states. Following independence, the region was geographically isolated as a result of India's division, stopped cross-border trade due to foreign policy concerns, and experienced internal unrest in a few areas. As a result, the region is currently ranked among the lowest achievers in terms of economic development, with most of its agriculture being in a backward state.

Flow of Institutional Agricultural Credit in NE States:

The analysis covered the institutional credit flow to regions overall and to the Northeastern states specifically between 2013–14 and 2019–20. In the Southern region, where agricultural growth is likewise more advanced, institutional credit accessibility is highest, while it is lowest in the Northeastern region. Only three states—Sikkim, Nagaland, and Meghalaya—have seen increases in crop loans, compared to the NER states' notable growth in term loans. Furthermore, in comparison to 2013–14, the gap between the agriculture loan flow per hectare for All-India and NER has grown by almost 73% (₹21993) in 2019–20. The loan flow per hectare in the Northeastern states in 2013–14 was ₹0.20 lakh in Tripura and ₹0.02 lakh in Arunachal Pradesh, or roughly 54% and 5% of the national average, respectively. Tripura, the most northeastern state, has an average credit flow per hectare that is 17% lower than the national average in 2019–20. The average credit flow per hectare in the other states is significantly lower. Agricultural credit contributed more than 40% of the share in the southern region and less than 2% in the northeastern region.

Report on Study on Reasons for Low Credit Flow to Agriculture Sector in Meghalaya-

Agricultural credit is divided primarily into Short Term Agricultural Credit (Production Credit) and Agricultural Term Loan (Investment Credit).

The entire amount of agricultural credit achieved as of March 2020 was just 23%; public sector banks disbursed 54% of the total amount of agricultural credit issued during 2019–20, with Meghalaya Rural Bank (MRB) coming in second with 25%. Although Meghalaya Apex Cooperative Bank (MCAB) disbursed 13% of the total amount of agricultural credit, private sector banks accounted for the least amount of agricultural credit, at 8%. The fact that in FY 2017–18, FY 2018–19, and FY 2019–20, private sector banks with a predominantly urban presence were only able to serve 0%, 0.82%, and 2.94% of the crop loan/KCC targets assigned to them indicates that these banks are not providing short-term loans or KCC.³

³ https://www.megahvt.gov.in/services/Reasons_LowCreditFlow_Agriculture.pdf

Reasons for low credit flow to Agriculture-

To improve the flow of credit for agriculture in the State, consideration must be given to the constraints faced by banks and borrowers in order to identify elements that will enable the flow of credit. The state-specific barriers to the expansion of agricultural credit disbursement could be outlined as follows:

1. **Low ability to deal with credit-** Roughly 82% of all farmers in the state are small and marginal farmers, and they cultivate roughly 62% of all the land that is cultivated. The majority of farmers cultivate primarily for their own consumption through subsistence farming, which eliminates the need for bank loans.
2. **High Transportation Cost-** Meghalaya's hilly geographical locations drive up the cost of transporting agricultural products to Rs 44/-per running kilometre. Meghalayan products continue to compete in pricing with commodities accessible from other states, despite the GoM ITeams project cutting transportation costs in half.Excessive transportation expenses thus diminish the farmers' profit margin and weaken their trust in repaying the loan with interest.
3. **Low level of awareness-** The majority of farmers in the state lack formal education, and many are scared to ask the banks for the credit they need. For their urgent needs, the majority of them choose moneylenders because there is little documentation involved, even though the interest rate is higher—between 20% and 25% each month.
4. **Land Tenure System-** Land cannot be used as collateral under the Land Tenure System. Creating structured and current land records is severely hindered by the lack of survey data and digitization of land records. One of the biggest challenges to banks extending loans is the legitimacy of the title papers and their legal enforceability. The primary argument given by banks for not providing credit support for long-term loans required under mechanisation of agriculture, plantation & horticulture, fishery, commercial diary, etc., and high value crop loans (>Rs1.60 lakh) is the land tenure structure and restrictions on the transfer of land titles.
5. **Indebtedness-** Debt is another indicator that demonstrates little borrowing in NER. Access to credit is a recurring problem in India overall and in NER specifically. According to SAS 2012–2013, the NE states have the lowest levels of debt, with Meghalaya (2.4%) and Manipur (23.9%) having the lowest levels and the national average being about 52%. This suggests that farmers in NER borrow little money.

In Northeastern India, hill agriculture faces significant challenges due to high risk and unpredictability caused by multiple variables. A significant amount of private investment has not been drawn to agriculture because of the current circumstances, which have been shown to limit the expectation of a regular and guaranteed income from the sector. This data made it very evident that the area is utilising or obtaining the least amount of agricultural loans nationwide. This suggests a low level of capital formation in the region's agricultural sector, which is linked to low levels of credit flow, investment capacity, and farmer risk tolerance. They are therefore forced to practise low-input, low-output subsistence farming with little amount of marketable surplus due to the current risk and uncertainty environment. It's critical to take a different perspective on funding in the area.

Case Studies

BIHAR

It is well-known that the vast majority of Indian farmers, especially those in Bihar, are small and marginal. According to estimates, over 84% of Bihar's farmers run small, marginal farms. The Bihar's Climate Resilient Agriculture (CRA) Program addresses the problems posed by climate change and its detrimental impacts on agriculture, especially rice farming. The program, which is being implemented in 38 districts, uses cutting-edge techniques to boost sustainable farming, lower environmental effects, and increase output. Bihar's major crop, rice, is subject to climate change because of unpredictable rainfall, droughts, and rising temperatures. Rice agriculture is extremely inefficient in light of changing climate circumstances due to traditional methods like puddled transplanted rice (PTR), which take a lot of water, worsen soil compaction, and decrease water-use efficiency.

Challenges Faced By the Farmers -

More than 84% of farmers in Bihar own tiny landholdings, therefore the high initial costs associated with technologies like raised-bed planting and Laser Land Levelling (LLL) was a barrier for small and marginal farmers. Many farmers mostly depended on government funding for fertiliser, seeds, and tools. Timely adoption was hampered by subsidy disbursement delays.

Farmers found it challenging to implement large-scale interventions like nutrient mapping and water bunding due to their small and fragmented landholdings. Despite methods like AWD (Alternate Wetting and Drying), water limitations made irrigation less effective, particularly in areas like Munger and Banka.

Farmers who were not familiar with new technologies, such as direct-seeded rice (DSR) and zero tillage, were hesitant to adopt them because they required technical expertise. Aerobic DSR practices increased weed diseases, which in turn increased the requirement for herbicides and originally increased production costs. In northern Bihar, unpredictable rainfall patterns and recurrent floods restricted the efficacy of CRA techniques like in-situ water harvesting and crop diversification. Despite training, some farmers were afraid to adopt CRA technology because they did not fully comprehend its long-term advantages. Considering their important role in agriculture, women farmers frequently had limited access to training and decision-making opportunities.

Measures taken under CRA to improve -

Subsidies were given to farmers for expensive technologies such as agricultural residue management instruments and laser leveling. Assistance with seeds, fertilizer, and herbicides was also given. In addition to lowering individual farmer expenses, cooperation with Krishi Vigyan Kendras (KVKs) guaranteed access to pooled equipment. Creating hubs in each district facilitated peer-to-peer learning and the group adoption of new techniques.

Medium—and short-duration rice should be used in place of long-duration rice to reduce climate risks and guarantee that succeeding crops are sown on schedule. Mechanized instruments and chemical weed control were introduced to reduce weed growth in DSR fields.

In order to facilitate site-specific nutrient management and minimize fertilizer waste, farmers were provided with district-level soil fertility maps. Farmers were urged to implement intercropping and multi-cropping techniques like rice-wheat-moong to lessen their reliance on crops that require a lot of water.

Outcomes

The net income of farmers increased by 48.13% for maize and 23% for rice. Across all crops, the total benefit-cost ratio increased dramatically. Water use decreased by 11.88% for wheat and 33% for rice, indicating an increase in water use efficiency. Farmers were able to make more accurate choices and adjust to climate change, because of the growing use of technologies like zero tillage, AWD irrigation, and nutrition expert tools.

Therefore, tackling the effects of climate change on agriculture is closely related to Bihar's Climate Resilient Agriculture (CRA) Program. Bihar requires adaptive solutions to guarantee sustainable agricultural output and livelihood security because of its extreme vulnerability to fluctuations in the climate, including unpredictable rainfall, frequent floods, and droughts. In Bihar, the program

provides a thorough approach for addressing the dual problems of climatic variability and sustainable food production.

Impact of Climate Change on Cotton Farming in Maharashtra

Vidarbha is a region in eastern Maharashtra, and Marathwada is located to the west of Vidarbha and has a population of 18,731,872. Agriculture, horticulture, textiles, education, and agro-processing are some of the major industries in both regions. The main issues facing Vidarbha and Marathwada were unemployment, water scarcity, and serious agrarian issues. The repeated droughts affected agriculture, leading to crop failures, debt, and social shame. The "Farm Pond on Demand" effort in Maharashtra aimed to provide protective irrigation in order to overcome water shortages and alleviate the state's drought. As a result of the program, farmers' yields increased twofold, water availability improved, the water table rose, crop patterns changed, and pisciculture provided additional revenue.

On February 17, 2016, the agriculture department of the state government introduced the Magel Tyala Shettale Yojana (Farm Pond on Demand) program. Farmers received financial assistance under the program to construct ponds on their properties, which would enhance water storage for farming, particularly during dry seasons.

- The program was launched in March and ran until the Rabi crops were harvested in May.
- Within seven days of building their agricultural ponds, farmers received bank account subsidies of up to INR 50,000.

After the implementation of the project:

- In all, 15,000 pond farms were built across 22,500 hectares of agricultural land.
- Annual agricultural yield doubled.
- Crops were protected from soil moisture deficiency by ensuring protective irrigation.
- Farmers' income increased through pisciculture ventures.
- Cultivation of new crops such as cucumber, bitter gourd, and tur was initiated.

The project faced the following challenges:

- Drought vulnerability of Vidarbha and Marathwada

- Rainwater dependency of farm ponds
- Presence of contaminants in water
- Poor soil quality

Ground Level Implementation-

The primary goals of the farm pond policy and the actual use of these ponds by farmers are obviously at odds with one another. Even though one of the primary goals of the farm pond strategy is to collect and store rainwater, it is nearly impossible to locate a working farm pond that does just that. The majority of farm pond owners continued to extract groundwater from drilled and borewells and then store it in their ponds, which is clearly opposite to the goal for which they were built. As a result, farm ponds have emerged as the new method of extracting groundwater, which has made farmers increasingly competitive in their attempt to do so. To prevent the seepage of stored water, high-micron plastic paper is used in practically all operational agricultural ponds, and through plastic subsidy, the state is even encouraging the use of plastic lining. Water from the ponds has minimal chance of seeping into the groundwater as a result.

The second major issue is the general lack of proper planning and regulation when approving agricultural ponds and during their actual construction. The total number of farm ponds to be built in a given village or watershed area should ideally be designed based on the area's capacity. There seems to be a lack of clarity among the staff members charged with implementing the strategy. Another problem is the possibility that farmers were building agricultural ponds larger than was allowed. Even if subsidies are provided for the construction of farm ponds of a specific size, almost all farmers actively spend money to expand the size and depth of their ponds in order to store more water.

The third major issue of concern is the increasing rate of evaporation of the overall surface water and particularly the water stored in farm ponds. In many pockets of arid and semi-arid Maharashtra/, the maximum temperature during summer reaches up to 40°C to 45°C which increases the rate of evaporation. Therefore, with an increasing number of farm ponds—regulated or not—a huge amount of groundwater extraction to store water in the ponds, and a changing and volatile climate, the issue of evaporation of water from farm ponds becomes more alarming and is a cause for serious concern.

Central government initiatives for farmers may be significantly impacted by government policies and ambitions. Its primary goals in India are to increase agribusiness employment, boost rural development, upgrade farmer infrastructure, and provide farmers with sufficient funding. The

objectives of these programs are typically to address specific issues, offer advantages, or encourage growth in different sectors of the country's economy or society.

Recommendations

Information Flow to farmers- The most important factor in ensuring that PMFBY is implemented effectively is raising the agricultural community's understanding of it. Village-level workers plan regular discussions at short intervals to spread knowledge of PMFBY and encourage people to participate in the program. The country must organise periodic farmer festivals and training programs to inform farmers about the Scheme's multiple aspects, such as the necessity of crop insurance, the district's climate, the enrollment process, the location of nearby facilitation centres, etc. In order to share experiences about the insurance program, farmers across different villages who have already registered under the program have to be permitted to participate in such discussions.

Coverage of Crop/ Risks- Important crops must be protected by crop insurance. Farmers who have been growing crops that failed to generate profitability for a number of years ought to be pushed to diversify. Other acceptable crops should be planted in place of those whose cultivation has been impacted by weather fluctuations. The marketing department or board should set the farm gate price for crops for which MSP has not been proclaimed like vegetables.

Allocation of Funds- A budget would be required for the creation of unique, innovative insurance products as well as for the successful implementation of technology in the administration and evaluation of crop insurance. It is advised that a special fund be established for this purpose. As a yield-protection insurance only, PMFBY is not thorough and avoids changes in prices. Farmers do not profit from the insurance program if they do not have revenue protection.

Group Insurance Scheme- A group insurance scheme is a type of insurance plan that includes multiple individuals under a single contract. No matter their age, gender, occupation, or socioeconomic background, all members of a group will receive the same amount of insurance coverage under such a plan. Acquiring individual insurance plans for every member is no longer necessary when group insurance is in place. As part of the payment benefits, employers frequently offer group insurance coverage to their staff. Members of the group as well as their dependent parents, spouses, and kids are covered under such a plan. A few states, like Telangana, AP, and TN, have taken a stand to promote group insurance in order to include landless farmers in the program. It recommended that different states adopt the same.

Digital record keeping- We should promote digital enrollment through local common service centres to mitigate delays and errors . This will ensure accuracy and efficient data management, lowering mistakes in PMFBY claim processing and farmer enrollment. Farmers would benefit from this as it will help them understand all aspects of the procedure and monitor their claims, loans, document verification, errors, and any new updates that may develop.

Third Party Interference- Independent agencies must be hired to verify agricultural losses, which guarantees objective evaluations under PMFBY. Using drones or on-ground inspection, these organisations could help in clearly verifying claims and resolving any disagreements that could come up between the farmer and insurers.

By Implementing these recommendations, the PMFBY can become more inclusive, transparent, and impactful, ensuring farmers genuinely benefit from the scheme.

Conclusion

The government intends to support farmers in creating a climate-resilient agricultural system in India by implementing crop insurance programs in a number of ways. Farmers receive financial protection by crop insurance against losses brought on by extreme weather events, such as heatwaves, floods, storms, and droughts, which are occurring more frequently and with greater degree as a result of climate change. Insurance supports farmers to participate in sustainable practices and technology that increase resilience to climate-related risks by reducing the financial risks associated with crop loss. Under the Ministry of Agriculture & Farmers Welfare, PMFBY is currently India's premier crop insurance program. It has gained significant momentum and acceptance and regularly offers farmers financial protection in the event of crop failure or damage brought on by unexpected climate changes. The paper emphasises the necessity of financial tools and policies that are able to meet the changing demands of the agriculture sector in the face of climate change. The long-term sustainability of agricultural and rural livelihoods can be insured by developing resilience through innovative credit solutions and sustainable practices.

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