



EXPANDING COVERAGE AND REDISTRIBUTION OF BENEFITS: AN ANALYSIS OF RISK PROTECTION EFFICIENCY (RPE) UNDER PMFBY

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Abstract: Agriculture in India is highly vulnerable to climatic and production risks which makes crop insurance a crucial policy instrument for income stability of farmers. The Pradhan Mantri Fasal Bima Yojana (PMFBY), launched in 2016, aims in enhancing financial protection and expanding insurance coverage among farmers. This study analyses the performance of PMFBY using an indicator termed Risk Protection Efficiency (RPE), defined as the average benefit received per farmer. The study is completely based on secondary data for both Kharif and Rabi seasons from the official website of PMFBY during the year 2018 to 2025. The study examines trends in loanee farmer participation, benefit distribution and inter-state variations. The results indicate a significant increase in farmer enrolment over time, reflecting expansion of coverage. However, total benefits show fluctuations and RPE exhibits a declining trend in recent years. Seasonal analysis reveals relatively higher RPE in the Kharif season compared to Rabi, while state-level analysis highlights considerable variation in benefit distribution. The findings suggest that as participation expands, benefits are distributed across a larger number of farmers, resulting in lower average benefit per farmer. The study concludes that PMFBY reflects a shift from concentrated benefit distribution to broader coverage, consistent with the principle of diminishing marginal returns. It emphasizes the need for strengthening implementation mechanisms and ensuring proportional resource allocation to enhance the effectiveness of benefit delivery.

Index Terms - Farmers, Risk Protection Ratio Benefit, Participation of farmers, Claim Settlement, Diminishing Marginal Returns, PMFBY Scheme

I. INTRODUCTION

Agriculture remains a vital sector of the Indian economy which contributes approximately 18 per cent to the Gross Domestic Product (GDP) and provides livelihood to nearly 45 per cent of the population. Despite its significance, the sector is highly vulnerable to multiple risks such as climatic variability, pest attacks and market uncertainties. All these risks directly affect farm productivity and income stability of farmers. Crop insurance has therefore emerged as a critical policy tool for mitigating these risks. In India, the earliest organized crop insurance initiative was the General Insurance Corporation of India (GIC), 1972, which introduced pilot schemes to provide financial protection against crop losses to the farmers. Having GIC as a base, the government later implemented structured schemes such as the National Agricultural Insurance Scheme (NAIS), 1999 and the Modified National Agricultural Insurance Scheme (MNAIS), 2010. However, these earlier schemes faced several limitations like low farmer coverage, higher premium burden and delays in claim settlement. To overcome these limitations, the Government of India introduced the Pradhan Mantri Fasal Bima Yojana (PMFBY) in 2016 as a more comprehensive and farmer-friendly crop insurance scheme which aims at ensuring income stability and promoting agricultural sustainability.

PMFBY is designed to provide uniform and affordable insurance coverage across the country. Under the scheme, farmers pay a nominal premium of 2 per cent for Kharif crops and 1.5 per cent for Rabi crops, while the remaining premium is shared between the central and state governments. The scheme is compulsory for loanee farmers availing institutional credit and voluntary for non-loanee farmers. It covers a wide range of risks which includes, prevented sowing, standing crop losses due to natural calamities and

post-harvest losses. Premium payments are linked to crop seasons (Kharif and Rabi) and claim settlements are carried out based on yield estimation through crop cutting experiments, increasingly supported by remote sensing and technology-based assessments.

In recent years, PMFBY has expanded significantly in terms of farmer enrolment, area coverage and financial allocation. A substantial proportion of enrolment is driven by loanee farmers linked to institutional credit, which has improved outreach but also raised concerns regarding the actual effectiveness of the scheme. While increased participation is often viewed as a measure of success, it does not necessarily imply improved risk protection at the individual farmer level. This raises a critical question: whether the benefits received by farmers are proportionate to the growth in participation of loanee farmers.

To address this gap, the present study introduces Risk Protection Efficiency (RPE), defined as the average benefit received per farmer, to measure the per-capita effectiveness. The analysis is grounded in the theoretical framework of diminishing marginal returns, which suggests that when the participation of loanee farmers increases, the additional benefit per farmer may decline due to resource constraints and administrative limitations. Using secondary data for both Kharif and Rabi seasons from 2018 to 2025, the study examines trends in participation, benefit distribution and RPE, along with inter-state variations.

By integrating seasonal and spatial analysis, the study provides a more understanding about PMFBY, moving beyond aggregate indicators to evaluate whether the scheme delivers meaningful and equitable risk protection to the farmers in India.

II. Objectives of the Study

- To measure and analyze Risk Protection Efficiency (RPE) and to assess the effectiveness of the PMFBY scheme.
- To analyze inter-state variations in Risk Protection Efficiency and identify disparities in the distribution of benefits under PMFBY.

III. Review of Literature

Roy and Mondal et. al., (2018) The study highlights the importance of government support and subsidies in ensuring the success of crop insurance schemes globally. It discusses structural challenges in India such as poor land records, lack of awareness and governance issues affecting effective implementation. Focusing on West Bengal, the paper evaluates PMFBY's performance in terms of adoption, implementation and governance, offering policy suggestions for improvement.

R Rai (2019) The study examines the role of PMFBY in addressing agrarian distress arising from crop failures, indebtedness, and low returns. It highlights that despite improvements over earlier schemes, PMFBY faces structural, logistical, and financial challenges. The paper evaluates the scheme's effectiveness in achieving uniform implementation under the objective of "one nation, one scheme."

Tiwari and Chand et. al., (2020) The study critically evaluates PMFBY, highlighting issues such as inadequate state support, delays in claim settlement, and an unsustainable subsidy structure. It emphasizes the skewed distribution of benefits and the systemic challenges faced by farmers despite policy interventions. The paper recommends a technology-driven, demand-oriented approach and greater institutional neutrality to enhance the effectiveness of crop insurance.

Kiruthika and Kasthuri (2025) The study highlights agriculture's vulnerability to multiple risks and the role of crop insurance in transferring these risks to ensure income stability. It examines PMFBY's effectiveness in providing financial protection through subsidized premiums, especially for small and marginal farmers. Using Kharif and Rabi data, the paper evaluates key performance indicators such as claim ratios and financial sustainability to assess its impact on rural resilience.

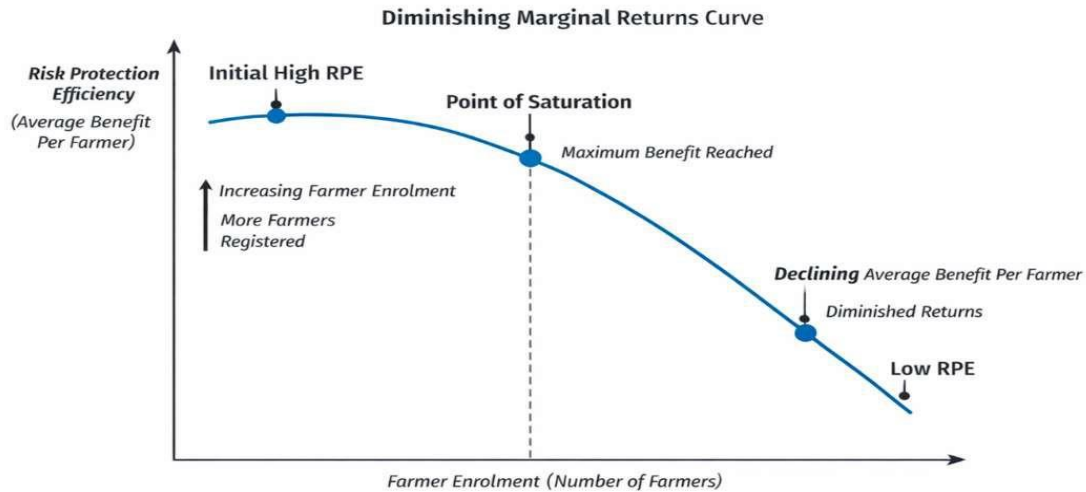
IV. Theoretical framework

The present study is anchored in the theory of diminishing marginal returns, which states that as the quantity of a variable input increases, *ceteris paribus*, the additional output derived from each additional unit eventually declines. In the context of the Pradhan Mantri Fasal Bima Yojana (PMFBY), farmer enrolment is considered as the input, while the benefits received by farmers represent the output. As the scheme expands and more farmers are enrolled, particularly through institutional credit mechanisms, the total benefits do not increase proportionately.

This leads to a decline in the average benefit per farmer, measured through Risk Protection Efficiency (RPE). The imbalance arises due to constraints such as limited financial allocation, administrative inefficiencies and uneven claim distribution across regions and seasons. Therefore, beyond a certain level of participation, the marginal benefit per additional farmer declines which indicates the presence of diminishing returns. This framework provides a theoretical basis to explain the observed divergence between increasing participation and declining RPE across both Kharif and Rabi seasons.

Figure: 1

Diminishing Marginal Returns in PMFBY



Source: Computed based on the theoretical framework

IV. RESEARCH METHODOLOGY

The study is based on secondary data obtained from official website of the Pradhan Mantri Fasal Bima Yojana (PMFBY). The data cover both Kharif and Rabi agricultural seasons data were collected for the period from 2018 to 2025. The dataset includes information on farmer enrolment ratio, total loanee farmer applications, farmer benefit (actual), claim paid and other related indicators. In addition, important state-wise data have been used to examine inter-regional variations in scheme performance.

4.1 Analytical Framework

The study evaluates the effectiveness of PMFBY using a participation–benefit framework, which compares the growth in farmer enrolment with the actual benefits received by loanee farmers. To capture the effectiveness of the scheme at the individual level (state-wise), a novel (India) indicator termed Risk Protection Efficiency (RPE) is constructed.

4.1.1 Construction of Risk Protection Efficiency (RPE)

Risk Protection Efficiency (RPE) is defined as the average benefit received per farmer and is calculated as:

$$RPE = \frac{\text{Total Farmer Benefit (In Lakhs)}}{\text{Total Loanee Farmers}}$$

RPE serves as a measure of the extent to which the scheme provides effective financial protection to individual farmers.

4.1.2 Inter-State Analysis

Important State-wise data are used to examine spatial variation in Risk Protection Efficiency. To ensure reliability, states with very low farmer participation (below 1000 loanee farmer participation) are treated as outliers and excluded based on a predefined threshold. This helps avoid distortion in RPE values caused by small sample sizes.

V. RESULTS AND DISCUSSION

Table 1: Farmer Participation, Benefit, and Risk Protection Efficiency (RPE) under PMFBY, Kharif Season in India from 2018 to 2025

Year	Loanee Farmers	Benefit Received (In Lakhs)	RPE
2018	2,14,81,975	84,38,592	0.39
2019	1,93,61,979	1,01,86,415	0.53
2020	1,68,04,816	63,24,161	0.38
2021	1,57,46,568	78,78,386	0.50
2022	1,91,20,847	70,32,825	0.37
2023	2,40,67,156	92,46,395	0.38
2024	2,47,25,396	67,09,991	0.27
2025	2,02,44,676	8,37,026	0.04

Source: PMFBY - Administrative Dashboard

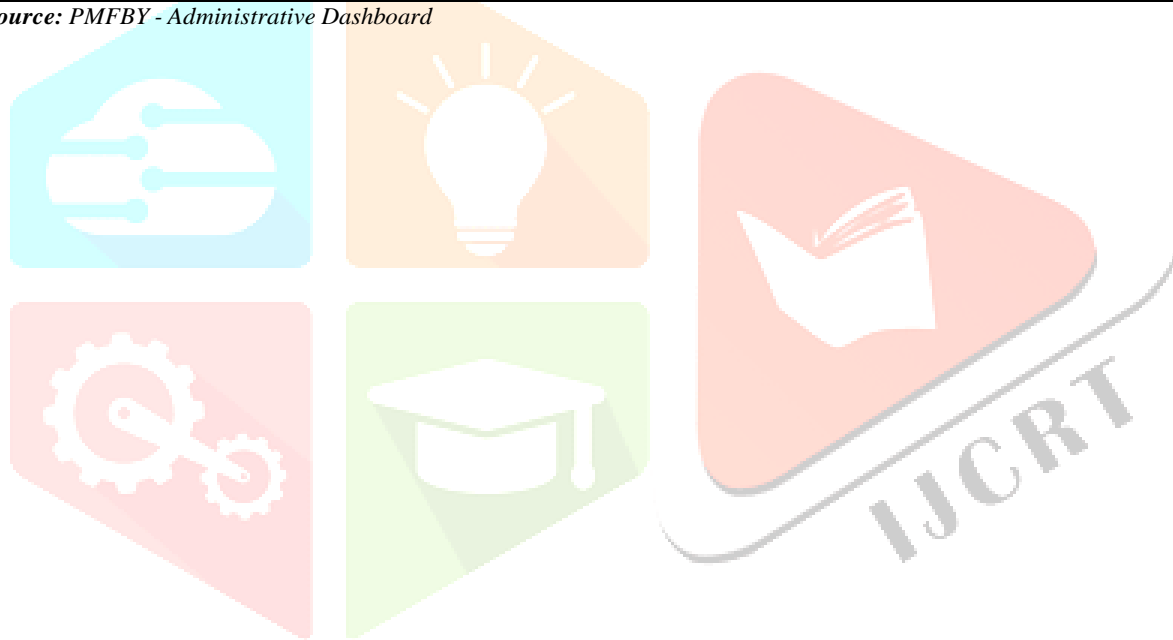
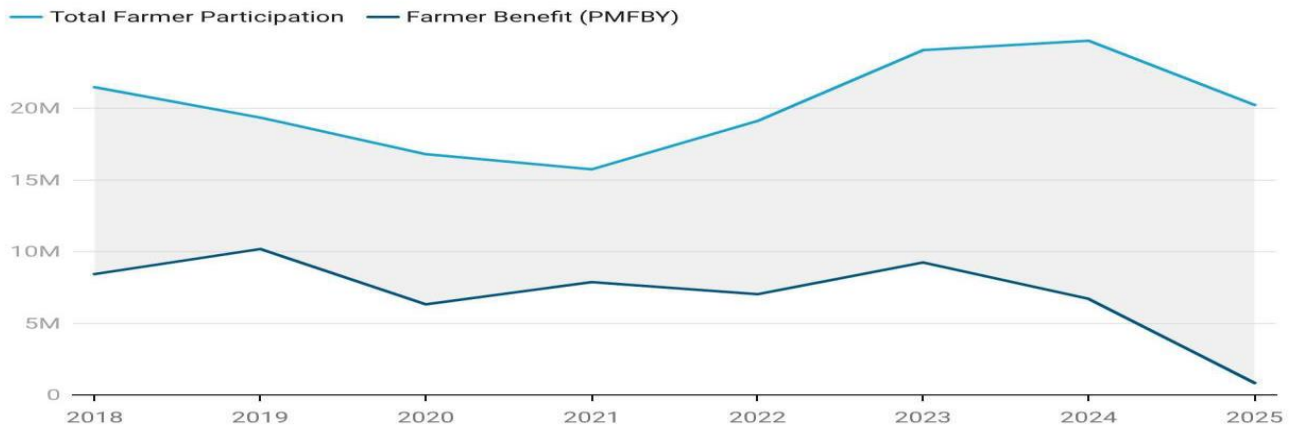


Figure: 2

Trend in Farmer Participation and Benefit under PMFBY (2018–2025)

Note: Participation is measured using total applications and benefit refers to total farmer benefit received.

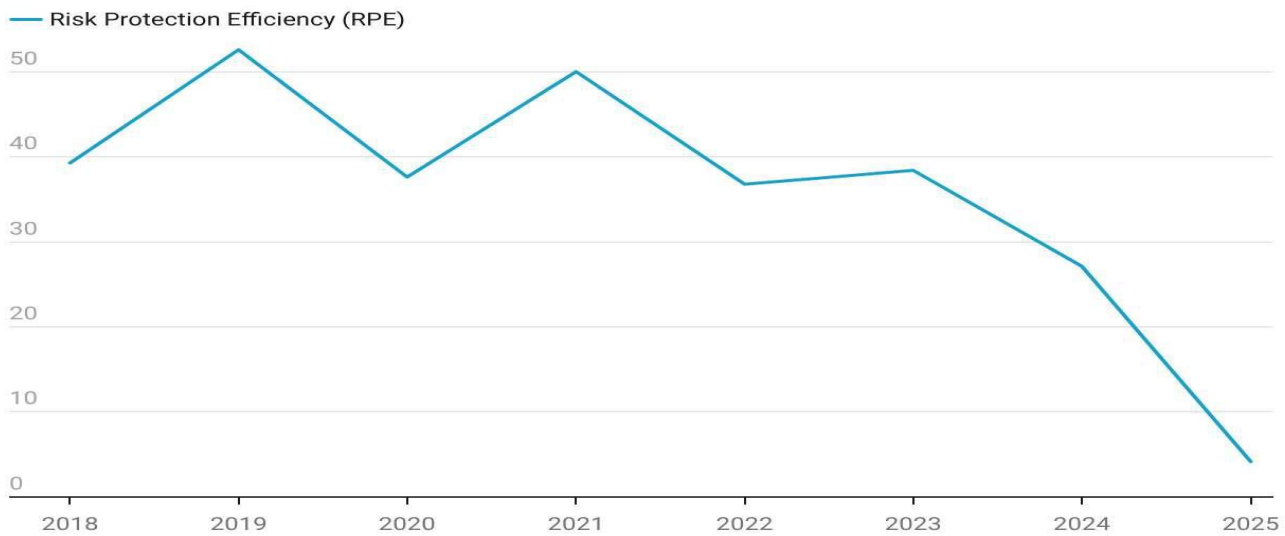


Source: Computation based on Table:1

Figure: 3

Risk Protection Efficiency (RPE) under PMFBY (2018–2025)

Note: RPE is calculated as Total Farmer Benefit divided by Total Farmers insured.



Source: Computation based on Table:1

The table 1 and figure 2 & 3 indicate that loanee farmer participation under PMFBY remains relatively high over the years during the Kharif season, reflecting the expansion of the scheme. Farmer enrolment increased from 2.14 crore in 2018 to a peak of 2.47 crore in 2024, before slightly declining in 2025. Total benefits, however, fluctuate across years, rising from ₹84.38 lakh in 2018 to ₹101.86 lakh in 2019, and then varying thereafter, with a sharp decline to ₹8.37 lakh in 2025. Correspondingly, RPE shows significant variation, reaching higher levels in 2019 (0.53) and 2021 (0.50), followed by a steady decline to 0.04 in 2025. The decline in RPE suggests that as participation increases, the average benefit per farmer becomes more distributed across a larger insured population. This reflects a shift towards broader coverage with relatively lower per-farmer benefit, indicating the presence of diminishing marginal returns in the distribution of benefits.

Table 2: Farmer Participation, Benefit, and Risk Protection Efficiency (RPE) under PMFBY, Rabi Season in India from 2018 to 2025

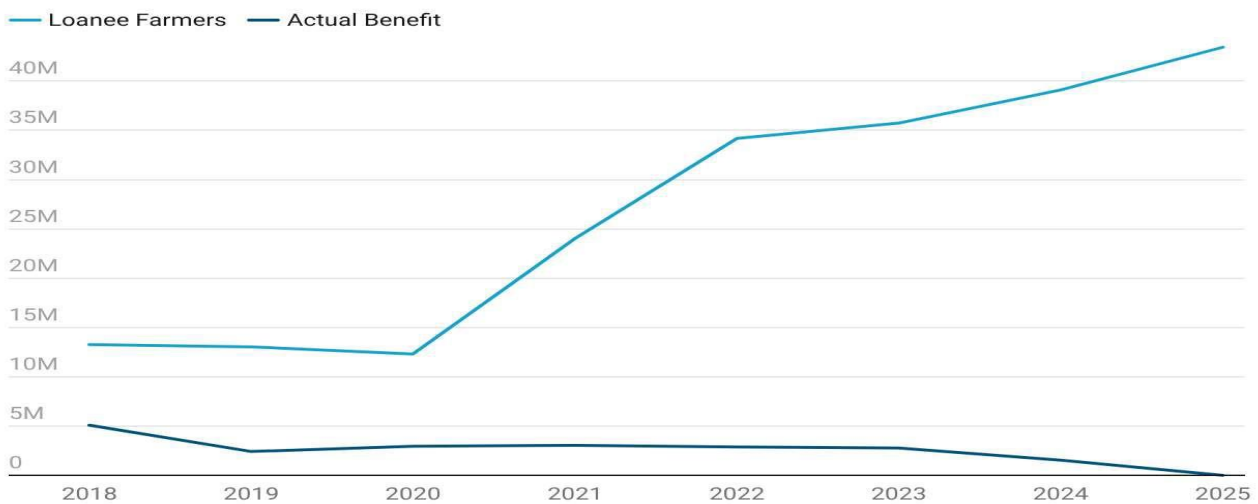
Year	Loanee Farmers	Benefit Received (In Lakhs)	RPE
2018	1,32,65,093	50,83,804	0.38
2019	1,30,33,587	24,18,559	0.19
2020	1,23,06,769	29,48,425	0.24
2021	2,40,40,228	30,34,724	0.13
2022	3,41,83,243	28,85,733	0.08
2023	3,57,30,284	27,68,436	0.08
2024	3,90,92,631	15,45,691	0.04
2025	4,34,28,285	3,356	0.00

Source: PMFBY - Administrative Dashboard

Figure: 4

Trend in Loanee Farmer Participation and Total Actual Benefit - Rabi Season

Note: Loanee farmers denote applications originating from credit-linked enrolment, while total farmer benefit represents the actual claims received by farmers

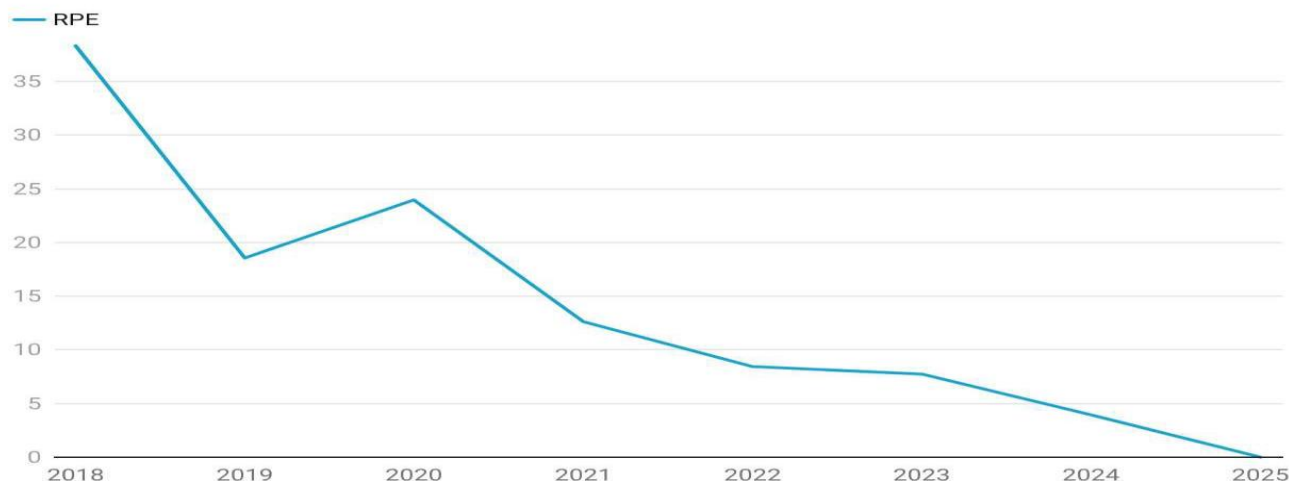


Source: Computation based on Table:2

Figure: 5

Trend in Risk Protection Efficiency (RPE) under PMFBY (2018–2025) - Rabi Season

Note: RPE (Risk Protection Efficiency) measures average benefit per farmer, calculated as total farmer benefit (₹ lakh) divided by total loanee farmers.



Source: Computation based on Table:2

The table 2 and figure 4 & 5 indicate a substantial increase in farmer participation under PMFBY during the Rabi season, especially after 2021. However, total farmer benefits show a declining trend over time, particularly after 2022. Consequently, Risk Protection Efficiency (RPE) has fallen sharply from 0.38 in 2018 to a negligible 0.01 in 2025. This suggests a significant reduction in the average benefit received per farmer. The divergence between rising participation and declining RPE highlights a strong participation-benefit mismatch. Overall, the results confirm the presence of diminishing marginal returns and indicate a weakening of effective risk protection under PMFBY.

Table 3: Inter-State Inequality in Risk Protection Efficiency (RPE) of Kharif Season from 2018 to 2025

Important States	Loanee Farmers	Benefit Received (In Lakhs)	RPE
Assam	55,235	73,527	1.33
Chhattisgarh	65,00,596	56,904	0.01
Haryana	90,93,069	86,348	0.01
Himachal Pradesh	1,00,517	28,204	0.28
Jammu & Kashmir	1,22,392	67,165	0.55
Jharkhand	5,11,990	25,894	0.05
Madhya Pradesh	96,31,683	9,10,123	0.09
Maharastra	6,74,862	37,90,634	5.62
Manipur	2,796	2,441	0.87
Meghalaya	1,041	18,597	17.86
Odisha	81,07,617	1,19,036	0.01
Rajasthan	2,03,63,740	6,77,952	0.03
Tamil Nadu	30,636	38,498	1.26
Tripura	6,981	2,873	0.41
Uttar Pradesh	48,02,879	3,71,305	0.08
Uttarkhand	28,361	8,379	0.30
Total	6,00,35,013	63,93,646	0.11

Source: PMFBY - Administrative Dashboard

Note: Certain states such as Goa, Puducherry, Meghalaya exhibit unusually high-Risk Protection Efficiency due to very low farmer

participation. These extreme values are driven by small denominators and do not represent actual efficiency. To address this, states with minimal participation (below 1000 loanee farmers) were excluded from the analysis to obtain more reliable estimates.

The state-wise analysis of the Kharif season reveals considerable variation in Risk Protection Efficiency across regions. States such as Maharashtra (RPE: 5.62) and Tamil Nadu (1.26) exhibit relatively higher per-farmer benefits, while large participation states such as Haryana (0.01), Odisha (0.01) and Rajasthan (0.03) show significantly lower RPE. For instance, Rajasthan records the highest participation with over 2.03 crore farmers but maintains a low RPE of 0.03, indicating distribution of benefits across a large insured population. In contrast, smaller states like Assam (1.33) show relatively higher RPE with lower enrolment levels. These variations reflect differences in crop risk, claim incidence and scale of participation across states. Overall, the pattern suggests that higher participation leads to wider distribution of benefits, resulting in lower average benefit per farmer, consistent with diminishing marginal returns.

Table 4: Inter-State Inequality in Risk Protection Efficiency (RPE) of Rabi Season from 2018 to 2025

Important States	Loanee Farmers	Benefit Received (In Lakhs)	RPE
Assam	52,833	59,783	1.13
Chhattisgarh	10,63,019	82,031	0.08
Haryana	81,86,580	23,095	0.00
Himachal Pradesh	1,08,684	2,628	0.02
Jammu & Kashmir	38,500	21,854	0.57
Jharkhand	1,06,484	0	0.00
Madhya Pradesh	82,30,760	2,72,315	0.03
Maharashtra	1,10,006	89,073	0.81
Odisha	3,94,710	10,984	0.03
Rajasthan	1,43,46,118	2,40,040	0.02
Tamil Nadu	4,01,307	4,55,681	1.14
Tripura	15,071	2,389	0.16
Uttar Pradesh	56,09,590	1,18,083	0.02
Uttarkhand	21,681	1,057	0.05
Total	3,87,73,543	13,85,487	0.04

Source: PMFBY - Administrative Dashboard

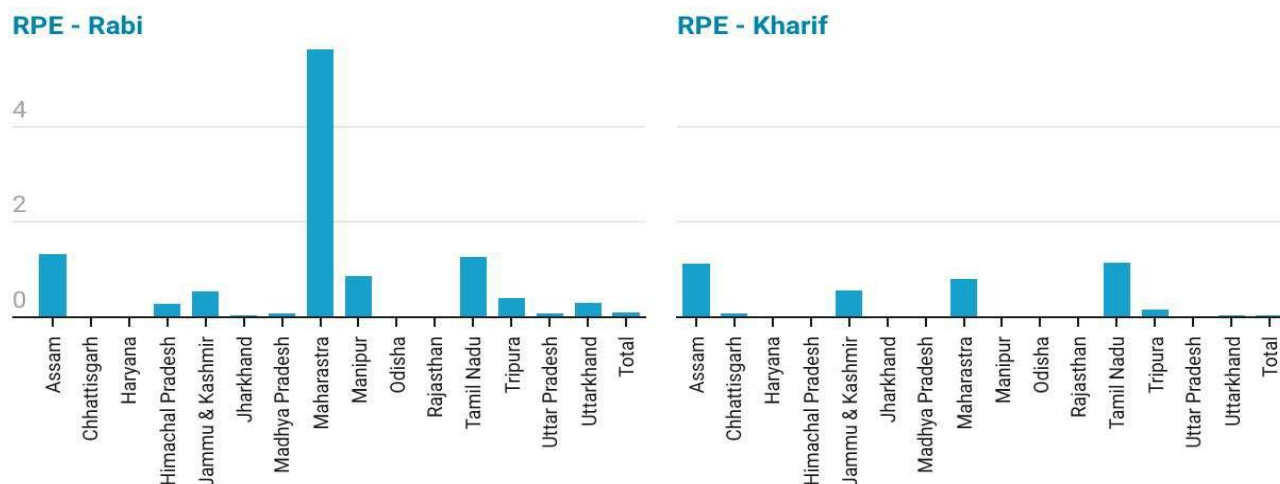
Note: Certain states such as Goa, Puducherry, Meghalaya exhibit unusually high-Risk Protection Efficiency due to very low farmer participation. These extreme values are driven by small denominators and do not represent actual efficiency. To address this, states with minimal participation (below 1000 loanee farmers) were excluded from the analysis to obtain more reliable estimates.

The state-wise results for the Rabi season from the table 4, shows significant variation in Risk Protection Efficiency across regions in India. Tamil Nadu (1.14) and Assam (1.13) exhibit relatively higher RPE, indicating better average benefit per farmer, while major agricultural states such as Haryana (0.00), Rajasthan (0.02) and Uttar Pradesh (0.02) show very low RPE despite high participation. For example, Rajasthan records over 1.43 crore farmers but maintains an RPE of only 0.02, reflecting distribution of benefits across a large number of insured farmers. Jharkhand records zero benefit despite participation, indicating possible absence of claims during the period. These variations highlight the role of seasonal risks, claim incidence and participation levels in determining benefit distribution. Overall, the findings indicate that as participation expands, average benefit per farmer declines, supporting the presence of diminishing marginal returns.

Figure: 6

State Wise Risk Protection Efficiency (RPE) in India under PMFBY (2018–2025) - Rabi and Kharif Season

Note: Graph represents the state wise average benefit per farmer across Kharif and Rabi seasons, enabling comparison of risk protection efficiency under PMFBY.



Source: Computation based on table 3 and 4

The comparison of RPE across Kharif and Rabi seasons highlights noticeable variations in benefit distribution across states. In states such as Tamil Nadu and Assam, RPE remains relatively higher in both seasons, indicating comparatively better per-farmer benefits. However, large agricultural states such as Haryana, Rajasthan and Uttar Pradesh consistently exhibit low RPE across both seasons despite high participation levels. Kharif season generally records slightly higher RPE in certain states compared to Rabi, which may be attributed to higher exposure to climatic risks and greater claim incidence during the monsoon period. The consistent pattern across seasons suggests that as farmer enrolment increases, benefits are distributed across a larger population. This reinforces the presence of diminishing marginal returns and reflects a shift towards broader coverage with relatively lower per-farmer.

VI. Major Findings

- Farmer participation has increased significantly across both Kharif and Rabi seasons, reflecting wider coverage driven largely by loanee farmers and institutional credit linkage.
- Risk Protection Efficiency (RPE) exhibits a declining trend, especially in recent years, indicating a reduction in average benefit received per farmer.
- Kharif season consistently records higher RPE compared to Rabi, mainly due to greater exposure to monsoon-related risks and higher claim settlements.
- The inverse relationship between participation and RPE suggests that increasing enrolment leads to wider distribution of benefits, reflecting diminishing marginal returns in benefit allocation.

VII. Conclusion

Seasonal variations reveal that Kharif generally records higher RPE compared to Rabi, primarily due to greater exposure to climatic risks and higher claim incidence. The state-wise analysis further highlights variation in benefit distribution, where states with higher participation tend to exhibit lower RPE, while relatively smaller states show higher per-farmer benefits. These findings suggest that as the scheme expands, it transitions from concentrated benefit distribution to broader coverage, resulting in lower average benefit per farmer. This pattern is consistent with the principle of diminishing marginal returns, where increased participation leads to redistribution rather than proportional enhancement of benefits. Overall, the study highlights the evolving nature of PMFBY, where increased inclusiveness and coverage are accompanied by changes in the intensity of per-farmer benefits. Strengthening claim settlement mechanisms, improving implementation efficiency and ensuring proportional resource allocation can further enhance the effectiveness of the scheme in delivering meaningful risk protection to farmers.

VIII. Policy suggestions

- Strengthen claim settlement mechanisms using technology for faster and accurate assessment.
- Ensure proportional increase in financial and administrative capacity with rising enrolment.
- Develop season-specific strategies to address differences between Kharif and Rabi risks.

REFERENCES

- [1] Kiruthika, M. P., & Kasthuri, V. (2025). Evaluating the Effectiveness of Pradhan Mantri Fasal Bima Yojana: A Seasonal Analysis of Financial Sustainability and Farmer Income Stability. *AIJFR-Advanced International Journal for Research*, 6(5).
- [2] Rai, R. (2019). Pradhan Mantri Fasal Bima Yojana: an assessment of India's crop insurance scheme. *ORF issue brief*, 16, 296.
- [3] Roy, B. C., Mondal, B., Ojha, S., Biswas, R. K., & Datta, V. (2018). Performance Evaluation of Pradhan Mantri Fasal Bima Yojana (PMFBY) in West Bengal. *Study Sponsored by Ministry of Agriculture and Farmers Welfare Government of India, New Delhi Agro-Economic Research Centre (For the States of West Bengal, Sikkim and Andaman & Nicobar Islands) Visva-Bharati, Santiniketan West Bengal*.
- [4] Tiwari, R., Chand, K., & Anjum, B. (2020). Crop insurance in India: A review of pradhan mantri fasal bima yojana (PMFBY). *FIIIB Business Review*, 9(4), 249-255.
- [5] <https://pmfby.gov.in/adminStatistics/dashboard>

