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Agricultural Insurance in Maharashtra, India: Determinants of Adoption and Policy Implications

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ABSTRACT

Maharashtra is known as a rainfed agricultural state and is highly prone to climatic fluctuations. Crop insurance schemes play a vital role in ensuring farmers' incomes during crop failures. However, the execution of PMFBY in India has faced numerous challenges, such as delays in settling claims, discrepancies between premiums collected and claims paid out, and unequal distribution. These multifaceted challenges highlight the complexity and the need to identify the determining factors for better adoption of the crop insurance scheme. Therefore, the key objective of this paper is to analyse the performance of PMFBY in Maharashtra, identifying key issues and barriers to its effectiveness and inclusiveness. This study adopts a mixed-methods approach. Secondary data was collected from existing literature, policy papers/reports to grasp the first-hand information. Primary data gathering encompasses surveys and discussions with 400 farmers, and insurance personnel, to glean insights into their encounters, perceptions, and suggestions concerning PMFBY. This research endeavours to examine the factors that influence the engagement of farmers in crop insurance programs through the application of binary logistic regression analysis. We analysed the impact of demographic, socio-economic, and behavioural variables on the probability of obtaining insurance coverage. The key findings indicate that educational attainment and access to irrigation resources enhance the likelihood of insurance participation, whereas gender and caste affiliations, exhibit a correlation with diminished participation rates. These findings underscore the need of targeting marginalized populations and aug-

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menting access to essential infrastructure in order to enhance insurance coverage and encouraging farmer involvement.

Keywords: Crop Insurance; Climate Change; Rain-fed; Risk Mitigation

1. Introduction

Agriculture globally faces inherent uncertainties, including market and production risks leading to annual income volatility [1, 2]. These risks involve yield losses from adverse weather conditions, pest outbreaks, and post-harvest losses during storage and transportation. Additionally, unpredictable market price fluctuations exacerbate financial instability for farmers. Over the past two decades in Asia, frequent natural disasters such as floods and drought have resulted in substantial economic losses [2]. In India, farmers in drought-prone regions may lose 12–15% of their average income, while those in semi-arid areas forfeit up to 27% due to risk mitigation efforts [2, 3]. Recent climatic trends, including extreme temperature fluctuations and heavy rainfall, have intensified agricultural challenges, leading to a decline in production [4]. This dual risk scenario of production volatility and price fluctuations significantly impacts household income and food security for farmers in India [5–7]. To overcome these challenges, efforts to enhance the resilience of agricultural insurance frameworks through technology are crucial [8].

Crop insurance schemes like the PMFBY play a vital role in stabilizing farmers' incomes during crop failures [9]. Despite government initiatives to expand insurance coverage through subsidized premiums, challenges like inadequate farmer awareness persist [10]. Low adoption of agricultural insurance persists among farmers in Maharashtra, even though it is promoted by the government. This may be due to a mix of social, economic, institutional, and awareness issues. To create better policies that encourage farmers to participate and improve their ability to handle risks, it's important to understand what drives these low adoption rates.

Agricultural insurance is pivotal for managing risks in farming, yet it remains largely inaccessible to most farmers in India [11, 12]. Insufficient agricultural insurance keeps farmers vulnerable to crop losses and financial instability, potentially leading to dire consequences such as indebtedness and suicide [13]. Challenges such as lack of transparency, delays in claim settlement, procedural complexities, and bureaucratic inefficiencies deter farmers from participating in crop insurance programs [14]. Moreover, smallholder farmers, who often lack access to credit, are significantly underrepresented in these schemes [15]. A study done by Arora & Birwal [16] indicates that wealthier farmers have better access to agricultural insurance than their smaller counterparts. Developing strategies to protect farmers from crop losses due to adverse weather, such as droughts and floods, is now a top priority for governments and donors. This is crucial given the expected increase in frequency and intensity of extreme weather events due to climate change [17, 18].

According to Ghosh et al. [19], only 25% of insured farmers chose to purchase insurance voluntarily, with the remaining 75% enrolled under compulsory loan default coverage, whereby any farmer applying for seasonal agricultural credit was required to obtain insurance coverage. The PMFBY aims to provide comprehensive insurance coverage against crop failures and stabilize farmers' incomes, addressing long-standing challenges in the agricultural insurance sector.

Addressing these challenges requires strategic interventions such as climate adaptation, integrated water management, fair farmer compensation, and robust crop insurance frameworks to ensure sustainable food security in India [20]. However, several critical issues undermine the effective implementation and uptake of agricultural insurance schemes like PMFBY in India. Ghosh et al. [21] highlight farmer dissatisfaction stemming from delayed and uncertain indemnity pay-outs under PMFBY, while Singh and Agrawal identify systemic challenges, including inadequate coordination among the agriculture department, banks, microfinance institutions, and private insurers, alongside flawed assessment of crop losses and delays in claim settlements [11]. Furthermore, Govindaraj [22] notes farmers' preference for government relief

payments over crop insurance due to accessibility [10] and emphasize the pervasive lack of farmer awareness about insurance schemes, necessitating extensive educational campaigns. Government efforts to improve insurance literacy in rural areas are crucial for enhancing understanding of claim processes and increasing accessibility to agricultural insurance [23]. Rajeev et al. [24] critique the design flaws of existing agricultural insurance schemes, which contribute to their low uptake among farmers. These multifaceted challenges highlight the complexity and urgency of addressing structural and informational gaps to promote broader adoption and effective utilization of agricultural insurance in India.

These existing studies on crop insurance are inadequate on a few counts. First of all, the low adoption of crop insurance has been examined only from a limited perspective focusing on its impact on farmer vulnerability to crop losses and financial instability, potentially leading to dire consequences. The determining factors for non-adoption of crop insurance have not been examined comprehensively. Therefore, factors responsible for the adoption and non-adoption of crop insurance need to be examined. Secondly, though a few studies have been carried out on challenges faced in the adoption of crop insurance, there is a paucity of literature on the level of adoption and its determining factors. Thirdly, the governments' policies and programmes have been major determinants in the adoption of crop insurance, having a direct influence on farmers. This relation is ignored. With the above motivation, statement of problem and review of literature the following researchable questions are raised:

- What is the performance of PMFBY and other government programs such as Weather Based Crop Insurance Scheme related to crop insurance?
- What are farmers' perceptions of crop insurance in terms of its accessibility, benefits, and effectiveness in mitigating agricultural risks?
- What are the determining factors responsible for the adoption and non-adoption of crop insurance?

Therefore, this study's objective is to identify the key socio-economic, demographic, and infrastructural factors influencing farmers' adoption of agricultural insurance schemes.

2. Materials and Methods

The empirical analysis is based on primary data collected through a household survey conducted in 2022. A designed primary survey tool was utilised for this survey and it was classified in various sections to understand the farmers' socio-economic characteristicsand attitudes towards the adoption of the crop insurance scheme. This methodological approach aimed to provide comprehensive insights into farmers' beliefs, experiences, and assessments regarding the scheme's effectiveness, benefits, and operational complexities. This study sought first-hand knowledge of farmers' perceptions, enriching the study with empirical evidence and informed analysis by utilising well-designed survey tool.

A multi-stage sampling technique focused on crops with substantial cultivation areas, specifically in selected study areas (Latur and Pune). Two blocks exhibiting significant cultivation of these crops were identified within each district. Following this, a random selection process was employed to choose 100 farmer households from each block, encompassing 67 insured farmers (a farmer who has enrolled in a crop insurance scheme and paid the necessary premium to protect their crops against specified risks) and 33 non-insured farmers (a non-insured farmer is a farmer who has not enrolled in any crop insurance scheme) per block. Non-insured farmers were chosen as controls to understand the situation without insurance and with insurance. The resulting dataset comprised a total of 400 sample households, comprising 268 insured and 134 uninsured farmers.

This methodological approach ensured a comprehensive and robust dataset for the study, facilitating a detailed analysis of farmers' perceptions towards crop insurance schemes in the respective regions. In order to examine the variations in socio-demographic and economic characteristics between insured and non-covered farmers, this study uses a quantitative, comparative research approach. The main statistical method for examining the gathered data was a one-tailed *t*-test. A one-tailed *t*-test was conducted to statistically examine whether significant disparities exist in these attributes. The test results provided empirical evidence supporting the presence of such differences, informing the study's conclusions on determinants of insurance adop-

tion. This statistical test is appropriate for examining whether the mean of a continuous variable differs significantly between two independent groups.

The formula used for the *t*-test is:

$$t = \frac{\underline{X}_1 - \underline{X}_2}{\sqrt{S_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where:

- $\bar{X}_1$, $\bar{X}_2$ are the sample means of group 1 (insured) and group 2 (non-insured)
- n_1, n_2 are the sample sizes of each group

Several studies on adoption within the domain of agricultural economics have conventionally utilized variable-centred methodologies, including binary logistic regression, to examine the determinants impacting farmers' decisions regarding the adoption of practices [25]. This study employs a quantitative research design using binary logistic regression to examine the determinants of farmers' participation in agricultural insurance schemes. The dependent variable is a binary indicator (id), equal to 1 if the farmer is insured and 0 otherwise. We employ binary logistic regression to estimate the probability of being insured as a function of several explanatory variables:

Model 1

$$log\left(\frac{p}{1-p}\right) - \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Gender + \varepsilon$$

Model 2

$$log\left(\frac{p}{1-p}\right) - \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Gender + \beta_4 SC + \beta_5 ST + \beta_6 OBC + \beta_7 Area + \varepsilon$$

Model 3

$$log\left(\frac{p}{1-p}\right) - \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Gender + \beta_4 SC + \beta_5 ST + \beta_6 OBC + \beta_7 Irrigation\ Acess + \beta_8 Area + \varepsilon$$

Model 4

$$log\left(\frac{p}{1-p}\right) - \beta_0 + \beta_1 Education + \beta_2 Age + \beta_3 Gender + \beta_4 SC + \beta_5 ST + \beta_6 OBC + \beta_7 Risk\ Attiute + \varepsilon$$

Variable Description

Variable Name	**Description**
Education	Years of formal education completed by the respondent
Age	Age of the respondent in years
Gender	Binary indicator (1 = Male, 0 = Female)
SC	Dummy variable for Scheduled Caste (1 = SC, 0 = Otherwise)
ST	Dummy variable for Scheduled Tribe (1 = ST, 0 = Otherwise)
OBC	Dummy variable for Other Backward Class (1 = OBC, 0 = Otherwise)
Irrigation Access	Binary indicator (1 = Access to irrigation, 0 = No access)
Area	Operational landholding area measured in acres
Risk Attitude	(1 = risk-loving, 0 = otherwise)
Constant	Intercept term in the model

3. Results

The empirical findings are presented in this section. **Table 1** presents findings derived from the one-tailed *t*-test which furnish empirical substantiation of notable disparities between insured and non-insured farmers regarding various socio-demographic and economic attributes. Specifically, individuals possessing insurance exhibit a markedly higher mean age (49.4 years) in comparison to their non-insured counterparts (46.1 years), yielding a mean difference of 3.3 years (t = 2.62, p = 0.0046). In a similar vein, the duration of formal education is significantly greater among the insured cohort (8.71 years) relative to the non-insured group (7.83 years), resulting in a mean difference of 0.9 years (t = 1.71, p = 0.0441), thereby indicating that

educational attainment may have a pivotal role in the propensity to acquire insurance. Furthermore, the incidence of group membership is also considerably higher among insured individuals (0.77) when contrasted with non-insured individuals (0.68), producing a mean difference of 0.1 ($t = 1.88$, $p = 0.0305$), which suggests that social networks may exert an influence on insurance engagement.

Additionally, the accumulation of experience in agricultural cultivation is more pronounced among insured individuals (25.75 years) than among their non-insured counterparts (23.84 years), with a mean difference of 1.9 years ($t = 1.76$, $p = 0.0394$), underscoring the notion that agricultural experience could be correlated with a heightened comprehension of risk management facilitated by insurance. Nevertheless, the size of the farm does not reveal a statistically significant distinction between the two cohorts ($t = 1.49$, $p = 0.069$), indicating that land ownership in isolation may not serve as a decisive factor for insurance participation. These insights imply that variables such as age, educational attainment, social networks, and agricultural experience are instrumental in elucidating the disparities in insurance uptake, thereby providing critical implications for policymakers and stakeholders striving to augment participation in agricultural insurance initiatives.

Table 1. Socio-economic characteristics of respondents.

Indicator	Insured (Mean)	Non-Insured (Mean)	Mean Difference	*t*-Statistic	*p*-Value
Age	49.4	46.1	3.3	2.62	0.0046
Years of Formal Education	8.71	7.83	0.9	1.71	0.044
Farm Size	6.61	6.11	0.5	1.49	0.069
Membership in Group	0.77	0.68	0.1	1.88	0.030
Experience in agriculture cultivation	25.75	23.84	1.9	1.76	0.039

Source: primary survey and author calculation.

3.1. Reasons behind Taking Insurance for Next Year

Table 2 presents critical insights regarding factors influencing farmer participation in crop insurance schemes. A prominent motivator for insured farmers is the assurance of receiving pay-outs, with 95.5% in Latur and 91.0% in Pune indicating that past pay-outs influenced their decision to enrol. The perception of risk reduction is another significant factor, cited by 100% of insured farmers in Latur and 97.8% in Pune. Notably, the role of bank officials in advising participation is more pronounced in Pune (90.3%) compared to Latur (29.1%), underscoring the potential influence of institutional support on enrolment decisions. Furthermore, perceived premium affordability is notably higher in Pune, where 91.0% of insured farmers find the rates reasonable, contrasted with 22.4% in Latur.

Ensuring reliability and trustworthiness is paramount to bolster farmer participation in agricultural insurance schemes such as PMFBY. Many farmers are reluctant to enrol due to a lack of confidence in insurance companies, leading to low adoption rates. A recommended strategy to cultivate trust involves enhancing the involvement of banks in scheme implementation, as they can significantly contribute to building farmer confidence. Additionally, ensuring prompt and adequate claim settlements is crucial. A study by Dey [26] emphasized that timely disbursement of claims not only enhances farmer trust but also expands coverage under PMFBY. These initiatives are critical for overcoming barriers to farmer participation and maximizing the efficacy of agricultural insurance initiatives.

3.2. Reasons not Taking Insurance

Table 3 identifies key barriers to participation in crop insurance schemes among farmers. Financial constraints pose a significant obstacle, with 71.0% of Latur farmers and 45.0% of Pune farmers citing an inability to pay the premium. Additionally, the perceived inadequacy of payout amounts discourages participation, as reported by 65.0% of Latur and 53.0% of Pune farmers. Delayed claim settlements present a substantial challenge,

particularly pronounced in Latur (89.0%) compared to Pune (30.0%). Lack of information is another pervasive issue, affecting 76.0% of Latur farmers and 91.0% of Pune farmers, underscoring the critical need for improved communication and awareness initiatives. Furthermore, mistrust in insurance schemes is notable, with 38.0% of Latur farmers and 30.0% of Pune farmers expressing scepticism. Addressing these barriers—enhancing affordability, ensuring timely and adequate payouts, improving information dissemination, and promoting trust—promises to increase farmer participation in crop insurance schemes.

In conclusion, most farmers could not pay the premium due to financial constraints at the time of payment. Additionally, some farmers expressed a lack of trust in the insurance company. It is crucial to prioritize efforts to build trust in insurance among farmers.

Table 2. Reasons behind insurance next year.

Reasons	Latur		Pune		Overall	
	IF (%)	NIF (%)	IF (%)	NIF (%)	IF (%)	NIF (%)
Paid out in last year	95.5	0.0	91.0	0.0	93.3	0.0
High pay-outs	3.0	0.0	91.8	0.0	47.4	0.0
Low Premium	22.4	25.8	91.0	0.0	56.7	12.9
Reduced risk	100	97.0	97.8	0.0	98.9	48.5
Securing income if it doesn't rain	94.8	93.9	95.5	0.0	95.1	47.0
Advised from bank officials	29.1	13.6	90.3	0.0	59.7	6.8
Reliable	30.6	13.6	88.8	0.0	59.7	6.8
Base	134	66	134	66	268	132

Source: Field survey.

Table 3. Reasons behind Insurance Didn't Insured.

Reasons	Latur (%)	Pune (%)	Overall (%)
Not able to pay the premium	71.0	45.0	58.0
No need	6.0	0.0	3.0
Pay-out is very low	65.0	53.0	59.0
Did not benefited in past	2.0	0.0	1.0
Our crops don't cover	26.0	0.0	13.0
Delay in claim settlement	89.0	30.0	59.5
No information	76.0	91.0	83.5
No Trust	38.0	30.0	34.0
Base	134	134	268

Source: Field survey.

3.3. Perceptions about Trust towards Implementing Agencies

Table 4 gives perceptions that implementing agencies play a pivotal role in the successful adoption and penetration of crop insurance schemes. Based on field survey data from the Latur and Pune districts, a significant majority of farmers exhibit high levels of trust in certain agencies involved in implementing these schemes. Bank officials are particularly trusted, with 99.3% of farmers in Latur, 100% in Pune, and an overall average of 99.6% expressing confidence in them. Similarly, the government agriculture department commands substantial trust, with 97.0% in Latur, 96.3% in Pune, and an overall average of 96.6%. Cooperative society officials also found considerable trust, with 80.6% in Latur, 98.5% in Pune, and an overall average of 89.6%. In contrast, trust in local office bearers is moderate, with 46.3% in Latur, 90.3% in Pune, and an overall average of 68.3%. However, trust in private insurance companies is notably lower, with only 17.9% of farmers in Latur, 41.8% in Pune, and an overall average of 29.9% expressing trust in them. This disparity underscores the imperative for initiatives aimed at enhancing trust between farmers and private insurance companies. Strategies to improve trust should prioritize transparency in operations, prompt and equitable claim settlements, and clearer communication regarding the advantages and

procedures associated with crop insurance.

The findings emphasize the importance of cultivating trust among all implementing agencies, particularly private insurers, to bolster farmer participation and confidence in agricultural insurance schemes. Enhancing trust is crucial for advancing India's agricultural sector's resilience against climate risks and optimizing the overall effectiveness of these schemes.

Table 4. Perceptions about Trust towards Implementing Agencies.

Implementing Agencies	Latur (%)	Pune (%)	Overall (%)
Bank officials	99.3	100.0	99.6
Private insurance company	17.9	41.8	29.9
Co-operative officials	80.6	98.5	89.6
Local office bearers	46.3	90.3	68.3
Government department	97.0	96.3	96.6
Base	134	134	268

Source: Field survey.

3.4. Determining Factors for Adoption of Agriculture Insurance

Table 5 shows the results from four logistic regression models estimating how likely farmers are to participate in an insurance scheme. The dependent variable is a binary indicator of whether the respondent is part of an agricultural insurance scheme. In Model 1, which only includes basic demographic predictors, education has a positive and significant link to insurance participation ($p < 0.001$). This suggests that people with more years of formal education are more likely to choose insurance. Gender also plays a significant role, with males being less likely to participate than females ($p < 0.05$). However, age does not have a statistically significant effect in this model. Model 2 expands the analysis by adding social group indicators (Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Classes (OBC), access to irrigation, and landholding size. The results show that SC and ST households are significantly less likely to participate in insurance compared to the reference group (likely general caste), with coefficients significant at the 5% and 10% levels. Access to irrigation is strongly associated with insurance participation ($p < 0.001$), meaning that households with irrigation access are more likely to engage in formal risk management. Education and gender remain significant, while age and area do not.

In Model 3, the predictors from Model 2 are kept, but the model is optimized, possibly through stepwise selection or based on model diagnostics (e.g., AIC). The significance and direction of key variables (education, gender, caste indicators, and irrigation) stay the same, with slight changes in standard errors and significance levels. The pseudo R^2 increases significantly, indicating a better model fit. Model 4 adds the respondent's risk attitude as a control. Although this variable is not statistically significant, including risk preference does not greatly change the effects of other factors. Education, gender, and caste indicators (SC and ST) remain statistically significant, confirming their strong relationship with insurance participation. Across all models, education shows a consistent positive and significant effect, emphasizing its important role in adopting risk management tools. The negative association for male respondents remains steady, indicating gender dynamics in insurance participation. Social disadvantage, represented by SC and ST indicators, seems to limit participation, highlighting potential inequalities in access. The models show an improving fit across specifications, with Nagelkerke R^2 rising from 0.14 in Model 1 to 0.367 in Model 4. The number of observations stays constant at 400 across all models.

Table 5. Determining factor for adoption of agriculture insurance.

Variable	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)	Model 4 B (SE)
Education	0.163 (0.034) ***	0.142 (0.036) ***	0.082 (0.041) *	0.083 (0.041) *
Age	0.022 (0.013)	0.019 (0.014)	0.009 (0.015)	0.009 (0.015)

Table 5. *Cont.*

Variable	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)	Model 4 B (SE)
Gender (Male = 1)	− 1.258 (0.514) *	− 1.333 (0.545) *	− 1.497 (0.560) **	− 1.496 (0.562) **
SC	-	− 0.834 (0.400) *	− 0.822 (0.400) *	− 0.822 (0.400) *
ST	-	− 1.426 (0.802) †	− 1.426 (0.802) †	− 1.373 (0.818) †
OBC	-	-0.503 (0.431)	− 0.503 (0.431)	− 0.492 (0.432)
Irrigation Access	-	-	1.972 (0.379) ***	1.999 (− 0.384) ***
Area (in acres)	-	-	0.119 (0.084)	0.116 (− 0.084)
Risk Attitude	-	-	-	− 0.144 (0.334)
Constant	0.246 (0.907)	1.119 (0.968)	0.901 (1.034)	0.248 (0.849)
Nagelkerke R^2	0.14	0.216	0.366	0.367
Log Likelihood	301.299	283.262	244.485	244.299
Observations	400	400	400	400

† = $p < 0.10$ (marginal significance), = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.
— = Not statistically significant ($p \geq 0.10$).

4. Discussions

The data underscores the PMFBY's crucial role in providing financial security to farmers against crop losses and highlights the fluctuating nature of agricultural risk management over the years. Notably, all received claims were fully disbursed to farmers, emphasizing the scheme's operational integrity and commitment to supporting agricultural resilience [26]. The PMFBY has encountered notable challenges, particularly concerning precisely assessing crop damage. Critics contend that the implementation of PMFBY has been inadequate in addressing yield losses and expeditiously disbursing claims to farmers' accounts [27]. Despite experiencing significant expansion compared to its predecessors, challenges persist, including delays in crop-cutting experiments, underestimation of crop losses, and delayed claim pay-outs [28, 29].

From the primary data results, it can be said that age is a crucial factor as individuals possessing insurance exhibit a markedly higher mean age (in comparison to their non-insured counterparts, yielding a mean difference of 3.3 years. Additionally, insured farmers identified Banks/District Cooperative Credit Societies (DCC) as their primary source of crop insurance information. Conversely, contacts within the village community and friends/neighbours were highlighted as significant alternative sources. Dissatisfaction with claim settlement processes is a primary deterrent to the adoption of agricultural insurance [30], particularly among vulnerable farmers [31]. Farmers consistently express discontent with delayed and uncertain indemnity payouts under schemes like PMFBY [19]. Mitigating this challenge requires the implementation of technological solutions aimed at establishing a more efficient, transparent, and farmer-centric framework within PMFBY [8]. These interventions are crucial for improving the overall efficacy and reliability of agricultural insurance schemes, potentially boosting their acceptance among farmers.

The findings suggest that education and infrastructure access are critical enablers of insurance adoption among farmers. Educated farmers may better understand the benefits and mechanisms of insurance, while irrigation access may increase their confidence in crop productivity, thereby making insurance more attractive. The significant gender and caste effects highlight potential structural barriers to insurance participation. Male farmers and those from SC/ST groups may face exclusion due to a lack of access, trust, or tailored outreach. These findings align with prior literature on socio-economic disparities in access to formal risk mitigation tools in agriculture. Interestingly, farm size and risk attitude did not significantly affect insurance decisions, suggesting that economic scale or behavioural traits may be less influential in this context compared to social and institutional factors.

Empirical results indicate that farmers' education shows a consistent positive and significant effect, emphasizing its important role in adopting risk management tools. The negative association for male respondents remains steady, indicating gender dynamics in insurance participation. Social disadvantage, represented by SC and ST indicators, seems to limit participation, highlighting potential inequalities in access.

The key result underscores that consistent pay-outs,

effective delivery by financial institutions, and perceived affordability are responsible factors motivating farmers to adopt crop insurance schemes. However, financial constraints pose a significant obstacle, the inadequacy of payout amounts discourages participation, delayed claim settlements are a substantial challenge, and a lack of information which is another pervasive issue. Furthermore, mistrust of insurance schemes is notable. Addressing these barriers—enhancing affordability, ensuring timely and adequate pay-outs, improving information dissemination, and promoting trust—promises to increase farmer participation in crop insurance schemes. Empirical evidence highlights significant delays in claim settlements as a pervasive issue that undermines farmer confidence. Ghosh et al.[19] research illustrates prolonged waiting periods for indemnity payments, often surpassing stipulated timelines, thereby exacerbating financial vulnerabilities following crop losses.

Perceptions of trust towards implementing agencies play a pivotal role in the successful adoption and penetration of crop insurance schemes. Supporting this, the Ministry of Agriculture and Farmers Welfare reports data indicate discrepancies between total claims accepted by private insurers and actual payouts disbursed to farmers[23]. A significant majority of farmers exhibit high levels of trust in certain agencies involved in implementing these schemes. Bank officials are particularly trusted. In contrast, trust in local office bearers is moderate, and trust in private insurance companies is notably lower. This disparity underscores the imperative for initiatives aimed at enhancing trust between farmers and private insurance companies.

5. Conclusions

The PMFBY launched in 2016 to mitigate agricultural risks through crop insurance, faces ongoing scrutiny regarding its effectiveness due to several critical challenges, such as financial constraints, inadequacy of payout, delay in claim settlements, lack of information is another pervasive issue. However, the cost associated with cultivation and the area of land are identified as the most prominent determinants for agriculture insurance adoption. Another significant finding is the trust deficit towards private insurers among farmers, evidenced by surveys in Latur and Pune districts, citing concerns over transparency and delayed claim processing (Trust towards Implementing Agencies). These empirical findings collectively underscore the critical need for policy reforms to improve claims processing efficiency, enhance transparency, regulate insurers for fairness, address regional disparities, and enhance farmer awareness to optimize the effectiveness of agricultural insurance schemes in India.

Addressing the challenges confronting agricultural insurance schemes like PMFBY in India necessitates several constructive policy implications. Firstly, optimizing the claims processing system through technological integration and adherence to clear timelines can mitigate delays and enhance transparency, thereby bolstering farmer confidence in the scheme's reliability[32]. Secondly, transparency and effective communication are crucial for building farmer trust. Moreover, ensuring fairness in premium pricing and pay-outs is imperative. Addressing regional disparities requires tailored approaches, such as customizing insurance products to suit specific agricultural risks and needs of diverse regions and implementing targeted interventions in vulnerable areas to achieve equitable benefit distribution. Lastly, continuous evaluation and enhancement of agricultural insurance policies are essential.

In conclusion, this study identifies key socio-economic and institutional determinants of insurance participation among farmers. Policy interventions should aim to expand insurance coverage along with improving awareness outreach and other supportive infrastructure, while addressing barriers faced by marginalized groups such as SC/ST communities. Future research could explore the role of institutional trust, awareness campaigns, and financial literacy in shaping insurance behaviour. Implementing such policy measures, like improving claims processing efficiency, enhancing farmer trust and transparency, ensuring fairness in premiums and payouts, addressing regional disparities, and committing to ongoing policy evaluation can strengthen India's agricultural insurance framework. This approach not only safeguards farmers against crop losses but also contributes to the resilience and sustainability of the agricultural sector amid persistent climate challenges.

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Conflict of Interest

The authors declare no conflict of interest.

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