

FACTORS INFLUENCING FARMERS' WILLINGNESS TO PARTICIPATE IN CROP INSURANCE: A STUDY IN SELECTED VILLAGES OF THE NORTH 24 PARGANAS DISTRICT OF WEST BENGAL

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Abstract

Motivation: Weather plays a pivotal role in influencing agricultural output. Unfavourable weather events, pest attacks, and the impacts of climate change wreak havoc on farmers' fortunes. Crop insurance emerges as the sole risk management tool at farmers' disposal to confront production risks in farming. This issue demands special consideration in the Indian context, given that 85% of the nation's farmers are small and marginal, with limited capacity to withstand such risks. The scarcity of affordable institutional credit sources puts farmers in a precarious situation, leading to a burden of debt in the event of crop failure. This debt crisis has already resulted in farmer suicides across various regions of the nation. Against this backdrop, the study aims to assess the extent to which the implementation of the Central government's flagship crop insurance scheme, Pradhan Mantri Fasal Bima Yojana, since 2016, has encouraged farmers to actively participate in the programme as a risk mitigation measure in agriculture.

Objectives: This study seeks to examine how various factors influence farmers' engagement in crop insurance within the study area and to identify key challenges that must be addressed to enhance farmers' involvement in the crop insurance scheme.

Research Methodology: A survey employing a multi-stage sampling method was undertaken to select farming households as respondents for this study. In the initial stage, the Aamdanga block in the North 24 Parganas district of West Bengal was selected due to its high cropping intensity. Subsequently, four villages with the maximum number of cultivating households within this block were chosen in the second stage. In the final stage, 268 farmers were randomly selected for interviews, with the selection proportionate to the size of their land holdings. Subsequently, a logistic regression model is employed to assess how various factors considered in the study influence the likelihood of farmers participating in the crop insurance programme.

Major Findings: The study reveals that farmers are more inclined to participate in the crop insurance scheme when they exhibit higher insurance awareness, possess experience in receiving indemnity for crop failure, have a history of borrowing from commercial banks, and hold larger landholdings. Conversely, the likelihood of engaging in the scheme decreases with age and the presence of alternative nonfarm income sources.

Policy Relevance: The study suggests regularly organizing workshops in rural areas involving both banks and beneficiaries to boost insurance awareness among farmers. It

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also recommends the prompt settlement of insurance claims, increased utilization of technology such as drones and satellite imagery for faster damage assessment in case of crop failure, a reduction in premium subsidies, and timely notification of insured crops for a specific harvesting season.

Originality: The study relies on a survey conducted by the author, ensuring the authenticity and originality of the data. Furthermore, it aims to address a research gap, as no prior study in this area has explored the factors influencing farmers' participation in crop insurance. This unique contribution can offer valuable insights to policymakers for refining their strategies.

Keywords: Crop Insurance, Factors Influencing Participation, Willingness, West Bengal

I. Introduction:

Agriculture is the cornerstone of India's economy, which is a pivotal force in driving the nation's overall progress. However, the inherent unpredictability of weather poses a continual threat to agricultural productivity, presenting formidable challenges in the form of adverse weather conditions, pest attacks, and the overarching impact of climate change. The vulnerability of farmers is exacerbated by the fact that 85% of them fall into the category of small and marginal (Economic Survey, Government of India, 2022), lacking the necessary resilience to confront these risks effectively. This precarious situation is further intensified by the absence of easily accessible institutional credit sources, leaving farmers vulnerable and burdening them with debt in the aftermath of crop failure. Tragically, this grim reality has manifested in instances of farmer suicides across diverse regions of the country.

Farmers often navigate risk by diversifying production towards less risky crops and adhering to traditional farming techniques, limiting the use of modern inputs. In various communities, especially in developing world village economies, informal risk-sharing arrangements like sharecropping, community-based risk-sharing, and extended family networks have emerged. However, a significant drawback is that participants often hail from the same area or village, facing similar risk profiles (Hazell, 1988). While schemes such as minimum support prices, contract farming, and future trading offer protection against price fluctuations, crop insurance stands as the exclusive institutional mechanism guarding against production risks in farming (Mukherjee and Mukhopadhyay, 2020). Crop insurance provides financial support to farmers facing crop failure due to adverse weather, pests, or diseases covered under the insurance agreement. Beyond financial assistance, it catalyzes farmers to adopt progressive agricultural practices, integrate high-value inputs, and embrace advanced technologies. This stabilizes farm income, particularly in disaster years, and disperses the impact of

crop losses spatially and temporally, preserving the dignity of farmers. In essence, implementing crop insurance safeguards fluctuations in farm income. It plays a pivotal role in diminishing rural poverty and ensuring the financial inclusion of small and marginal farmers in the nation.

Despite extensive government initiatives to implement mass-scale crop insurance schemes in the nation, the reach of such programmes has remained notably limited in terms of both the covered agricultural area and the number of insured farmers. In India, during the fiscal year 2017-18, the total area covered by crop insurance accounted for just 30% of the gross cropped area—less than half of the coverage achieved by the USA (89%) and China (69%) at the same time (Gulati, Tiwary, and Hussain, 2018). Despite the introduction of the government's flagship crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY), in 2016, which boasts superior design compared to previous schemes implemented since independence, only 19% of the nation's farmers were insured as of 2020. This stark disparity emphasizes the imperative for more effective strategies to enhance the coverage and effectiveness of crop insurance for the resilience of Indian agriculture. Simultaneously, a notable ambiguity persists in understanding the extent to which farmers value agricultural insurance compared to alternative risk management tools (Skees, 2000; Jensen et al., 2018). Accurate identification of the factors contributing to low crop insurance uptake among farmers is crucial for policymakers. This insight enables fine-tuning product design to better align with farmers' needs and preferences, ultimately fostering increased uptake.

It is crucial to highlight that the Government of West Bengal has replaced the Pradhan Mantri Fasal Bima Yojana (PMFBY) with a new crop insurance policy named the 'Bangla Shasya Bima Scheme' since 2019. This initiative aims to provide farmers in the state with a hassle-free and cost-free crop insurance scheme, with the government covering the entire insurance premium. The scheme offers financial assistance for crop loss due to Mid-Season Adversity, Prevented Sowing, or Failed Sowing, spanning from crop sowing to harvesting loss. While the coverage is mandatory for farmers availing seasonal agricultural operations loans from financial institutions, non-loanee farmers have the option to join. Notably, sharecroppers and tenant farmers are also eligible for coverage under this scheme. However, the current study focuses on the PMFBY, considering its established presence in the state and higher anticipated awareness among farmers compared to the newly introduced scheme by the Government of West Bengal at the time of surveying for this research.

This paper unfolds methodically through its distinct sections. In Section I, the paper commences by introducing the context and motivation propelling the study. Transitioning seamlessly, Section II undertakes a succinct review of related

literature, pinpointing the research gap. The study's purpose crystallizes in Section III, which explicitly outlines its objectives. Section IV lays bare the sources of data and the applied research methodology. The heart of the inquiry beats in Section V, where data is meticulously analyzed. Culminating this journey, Section VI delivers a conclusive end to the paper's exploration.

II. Brief Review of Literature:

A comprehensive examination of the literature addressing obstacles to the adoption of crop insurance reveals a diverse range of factors contributing to farmers' participation in insurance programmes. The first important factor contributing to farmers' non-participation is the existence of basis risk (Rukundo, Kamau & Baumullar, 2021). Despite the inherent risk aversion among farmers (Binswanger-Mkhize, 2012), the presence of basis risk often makes the decision to buy crop insurance precarious for smallholder farmers (Clarke, 2016). Basis risk occurs when there is a chance that insurance may not cover a farmer during an insured shock due to imperfect correlation with the insurance threshold, typically represented by an index. Increased basis risk reduces farmers' inclination to invest in insurance. Opting for insurance with substantial basis risk leads to income loss through paid premiums and limits alternative options, leaving farmers in a more unfavourable situation (Barré et al., 2016; Clarke, 2016; Jensen et al., 2016).

Numerous studies have highlighted the formidable challenge posed by liquidity constraints in restricting the ability and willingness of impoverished farmers to engage with crop insurance (Cole et al., 2013; Karlan et al., 2014). In recent investigations, scholars have expanded their focus beyond examining the available resources for impoverished farmers, delving into the critical aspect of the timing of insurance product availability (Belissa et al., 2020; Casaburi & Willis, 2018). A noteworthy revelation emerges regarding the cyclicity of farmers' incomes, demonstrating abundant financial resources during harvest periods. However, these resources significantly diminish at the commencement of the new planting season when farmers need to procure additional inputs. Most insurance products are marketed precisely at the onset of the planting season, inadvertently imposing constraints on farmers' decision-making processes regarding insurance uptake.

The skepticism surrounding crop insurance is further fueled by a pronounced lack of trust in the reliability of indemnity payments in the event of crop losses (Belissa et al., 2020; King & Singh, 2020). Frequently, farmers form their perceptions about the likelihood of receiving timely indemnity payments based on past experiences, which, particularly in the context of many developing nations, often lean toward the negative, consequently limiting their willingness to

invest in crop insurance. Furthermore, the extent of crop coverage, farmers' satisfaction with crop-cutting experiments, indemnity calculation in the aftermath of catastrophic events, and premium rates all significantly influence farmers' participation in crop insurance programmes.

Participation in crop insurance schemes is primarily driven by farmers' risk aversion, influenced by socio-economic factors like age, education, land size, asset position, and nonfarm sources of income. Various empirical studies (Gine et al., 2008; Sherrick et al., 2003) reveal that wealthy, young, and educated farmers are more willing to invest in insurance contracts. Conversely, farmers with nonfarm income sources are less likely to purchase insurance. Lack of access to institutional credit can also hinder participation in insurance schemes linked to loans.

Additionally, despite farmers being aware of production risks, they may exhibit cognitive failure by underestimating the likelihood or severity of catastrophic events (World Bank Report, 2010). Furthermore, there is a lack of insurance awareness and culture among farmers (Mukherjee and Mukhopadhyay, 2020). In developing nations like India, crop insurance is often perceived as non-viable because premiums are collected annually, while indemnities are paid infrequently. This perception, coupled with the belief that insurance is a privilege of the wealthy, inhibits the widespread adoption of crop insurance schemes (World Bank Report, 2010).

In this context, this paper aims to explore the factors influencing the farming community's participation in the Pradhan Mantri Fasal Bima Yojana (PMFBY) in the North 24 Parganas district of West Bengal. This study area is rich in agriculture, with approximately 97% of farmers being small and marginal. Additionally, the region is vulnerable to climate risks, marked by a history of major cyclones and flood events. This empirical investigation is the first of its kind in this locale, filling the existing research gap.

III. Objectives:

The study tries to

- assess the current level of farmers' involvement in crop insurance in the area of study.
- investigate the factors influencing farmers' participation in crop insurance.
- identify key challenges hindering farmers' engagement in the crop insurance scheme.
- propose recommendations for addressing challenges and enhancing farmers' participation in the crop insurance scheme based on study

findings.

IV. Data and Methodology:

Between October 2019 and January 2020, a survey was conducted in Adhata, Arkhali, Baraberia, and Bodai, four villages located in the Amdanga block of the North 24 Parganas district in West Bengal. Employing a multistage random sampling design, 268 cultivators were interviewed in proportion to the size of their landholdings, utilizing a pre-tested semi-structured questionnaire. The sampling procedure was systematically carried out in multiple stages. The selection of the Amdanga block over the other 21 blocks in the North 24 Parganas district was based on its highest cropping intensity, as per the 2011 Census Report. These four villages were chosen from the 79 in the block due to having the maximum number of cultivating households. Data on farm households in these villages were collected from an exhaustive list maintained by the State Agriculture Offices. The farmers who responded were randomly selected using the lottery method, and the sample size was determined using the Yamane method (1967).

To understand the influence of various socioeconomic and demographic factors on the maximum likelihood of farmers' participation in the crop insurance programme, a binary logistic model is used, and the coefficients of the following regression equation are tried to be estimated:

$$y_i = \log (p / 1-p) = \alpha + \sum_{j=1, \dots, 7}^{i=1, \dots, 268} (\beta_j \cdot x_{ji}) + u_i$$

Where y_i = Farmers' participation in crop insurance programme

$y_i = 1$, if the farmer has purchased crop insurance, and $y_i = 0$, otherwise.

α = intercept term, β_j s are the coefficients of the independent variables, & the error term is denoted by u_i

The explanatory variables are different socioeconomic and demographic factors related to respondent farmers, listed in Table 1.

Table 1: Explanatory variables

.	Type	Notation	Measurement
Insurance Awareness	Dummy	x_1	1 = if Yes, 0= otherwise
Education level	Continuous	x_2	Years of schooling
Nonfarm income	Dummy	x_3	1 = if Yes, 0= otherwise
Landholding size	Continuous	x_4	Hectares

Borrowing history	Dummy	x ₅	1 = if Yes , 0 = otherwise
Timely receipt of indemnity in the past	Dummy	x ₆	1 = if Yes, 0 = otherwise
Age	Continuous	x ₇	Years

Source: Own survey (October 2019 to January 2020)

p = probability that the farmer is willing to invest.

(p/1 – p) is the odds ratio, where $p = \frac{e^{\alpha + \sum_{i,j} (\beta_j X_{ji})}}{(1 + e^{\alpha + \sum_{i,j} (\beta_j X_{ji})})}$

The survey findings underscore the meager participation of farmers in the crop insurance programme in the study area, with only 25% opting for its coverage. Approximately 44.16% demonstrated awareness of crop insurance products and their potential benefits. Intriguingly, among those knowledgeable about insurance, only 34% made the purchase. The context unfolds with a starkly low literacy rate, where 63% of respondents are illiterate. Even among those educated up to the primary level, only 32% opted for crop insurance. Nonfarm income emerged as a pivotal risk mitigation strategy, with 43.3% of farming households relying on it. Only 15.3% of respondents with nonfarm income ventured into crop insurance. Land distribution unveiled a bottom-heavy structure, with 87% being small and marginal farmers with holdings of less than two hectares. Notably, 56% of farmers with larger landholdings embraced crop insurance. However, within the insured cohort, 31.7% experienced timely indemnity post-catastrophe. The demographic snapshot showcases that around 58% of respondents fall within the age bracket of 40 to 60 years.

V. Analysis of Data:

Before estimating the regression coefficients using the binary logistic regression model, one has to check the potential multicollinearity among explanatory variables under study through the Variance Inflation Factor (VIF) and Tolerance (1/VIF), detailed in Table 2. With a mean VIF of 1.14 (<2), multicollinearity is not a concern.

Table 2: Values of VIF & Tolerance

Name of the variable	VIF	1/VIF
Insurance Awareness	1.04	0.964
Education level	1.02	0.976
Nonfarm income	1.04	0.964
Landholding size	1.32	0.757

Borrowing history	1.10	0.908
Timely receipt of indemnity in the past	1.25	0.798
Age	1.17	0.855
Mean VIF = 1.14		

Source: Own survey (October 2019 to January 2020)

Table 3 displays that the Likelihood Ratio chi-square value is significant at a 1% level. The chi-square value in the Hosmer & Lemeshow test is insignificant. Additionally, the pseudo R-squared value stands at 0.499, confirming a good fit for the selected model.

Table 3: Goodness of Fit Test

Likelihood Ratio Test	
Likelihood Ratio chi-square (7) = 67.46	Log Likelihood = - 33.75
prob> chi-square = 0.000	Pseudo R Square = 0.499
Hosmer-Lemeshow Test	
Hosmer-Lemeshow chi-square = 4.16	prob>chi-square = 0.8426

Source: Author's calculation based on survey data

In this model, Specificity = 92.2%; Sensitivity = 78%; and overall Accuracy = 89%.

Tables 4 and 5 offer concise overviews of the estimated coefficients for the explanatory variables in the binary logistic regression model and their corresponding marginal effects.

Table 4: Results of the Logistic Regression Model

Independent Variables	Coefficient	Std. Error	Z value	Odds Ratio
Insurance Awareness	1.233*	0.684	1.80	3.432*
Education level	0.711	0.653	1.09	2.035
Nonfarm income	-1.258*	0.735	-1.71	0.284*
Landholding size	0.569	0.653	0.87	1.766
Borrowing history	1.721***	0.722	2.38	5.593***
Timely receipt of indemnity in the past	2.513***	0.687	3.65	12.343***
Age	-0.114***	0.035	-3.22	0.891***

Source: Author's calculation by using STATA

Table 5: Marginal Effects after Logistic

Y = Pr (Willingness to invest in farming practices) (predict) = 0.208			
Variables	dy/dx	Std. Error	Z value
Insurance Awareness	0.119*	0.071	1.66
Education level	0.068	0.067	1.02
Nonfarm income	-0.107*	0.006	-1.78
Landholding size	0.055	0.071	0.77
Borrowing history	0.198**	0.097	2.04
Timely receipt of indemnity in the past	0.311***	0.100	3.10
Age	-0.01***	0.034	-2.92
(*) dy/dx is for discrete change of dummy variables from 0 to 1			

Source: Author's calculation using STATA

The results indicate that raising awareness plays a pivotal role in enhancing farmers' inclination to purchase crop insurance. A well-informed farming community is empowered to make strategic decisions, understanding the protective benefits, assessing risks, and navigating insurance processes. Through effective communication channels, awareness fosters informed decision-making, ultimately elevating the likelihood of farmers investing in crop insurance for comprehensive risk management. Farmers who are aware of the benefits and operational procedures of crop insurance demonstrate significantly higher odds of purchasing it—3.432 times more than their unaware counterparts. The marginal effect analysis reveals a noteworthy 12% increase in the probability of purchasing crop insurance among informed farmers, holding other variables at their mean values. These results carry statistical significance at the 10% level.

Tables 4 and 5 reveal a trend suggesting that higher education levels among farmers may contribute to an increased likelihood of adopting crop insurance products. However, it's noteworthy that this impact lacks statistical significance.

Having a nonfarm source of income can serve as an alternative risk mitigation strategy in farming, stabilizing income during crop failure and, consequently, decreasing the likelihood of a farmer purchasing crop insurance. The odds of purchasing crop insurance for farmers with nonfarm income is only 0.284 times that of farmers relying solely on income from farming. The marginal effect indicates a roughly 11% reduction in the probability of purchasing crop insurance for farmers with nonfarm income, assuming other variables remain at their mean

values.

It is commonly anticipated that large landholding farmers would be more inclined to purchase crop insurance for two main reasons. First, operating on a larger scale exposes them to higher farming risks, motivating them to mitigate these risks through crop insurance, especially during catastrophic events or pest attacks, where potential losses are more substantial. Second, possessing greater income and assets compared to small and marginal farmers allows them to afford higher premium rates. However, this study finds that although the likelihood of crop insurance purchase is higher for large farmers, the result lacks statistical significance. This could be attributed to their alternative income sources, risk-mitigating strategies like crop diversification or livestock holdings, or perhaps negative experiences with prompt settlement of insurance claims during past disasters.

Farmers who have obtained loans for agricultural operations, such as field preparation, seed purchase, fertilizers, or machinery, from financial institutions are categorized as loanee farmers. According to PMFBY, participation in the crop insurance programme is mandatory for loanee farmers, while it is optional for non-loanee farmers. The study reveals that the odds of purchasing crop insurance for loanee farmers are approximately 5.6 times higher than for non-loanee farmers, with this result being statistically significant at the 1% level. The marginal effect indicates that, for loanee farmers, the probability of participating in the crop insurance program increases by 19.8%, holding other explanatory variables constant at their mean values.

The timely receipt of indemnity in the event of crop failure stands as a pivotal factor driving farmers to embrace crop insurance products. Beyond its immediate financial implications, it serves as a testament to the efficiency and management of the crop insurance system, fostering trust among farmers in insurance providers. The absence of indemnity or delayed payments following a catastrophe significantly jeopardizes farmers, impeding their ability to invest in the next year's cultivation and disrupting farming activities. For small and marginal farmers with limited fallback resources, such setbacks may force them to sell assets, exacerbating issues of poverty and malnutrition. The study reveals that the odds of purchasing crop insurance is about 12.34 times more for the farmers who received timely indemnity in the past than others. Furthermore, having timely indemnity increases the probability of purchasing crop insurance by about 31%, with this result being statistically significant at the 1% level.

Finally, age emerges as a significant factor influencing crop insurance adoption. Older farmers, drawing upon experience, tend to embrace conservative farming practices, relying on their accumulated knowledge to manage risks without

resorting to insurance. Their reduced inclination for change and resistance to newer financial instruments contribute to a decreased likelihood of purchasing crop insurance. In contrast, younger farmers exhibit a greater readiness to adopt progressive farming practices, incorporating modern inputs and being more open to engaging in riskier ventures. The study underscores this trend, revealing that the odds of older farmers purchasing crop insurance are 0.891 times that of their younger counterparts. The probability of older farmers buying crop insurance decreases by approximately 1%, maintaining significance at the 1% level when other variables are held at their mean values.

The challenges faced by respondents when purchasing crop insurance are multifaceted, encompassing various issues:

(a) Lack of Awareness: Farmers cited a lack of awareness about crop insurance, possibly stemming from insufficient publicity surrounding insurance schemes.

(b) Delayed PMFBY Notices: PMFBY notices often arrive after the sowing season has commenced, preventing farmers from claiming losses due to prevented sowing caused by adverse weather conditions.

(c) Threshold Yield Calculation Issues: Challenges arise in calculating threshold yields for insurance claims due to the unavailability and unreliability of historical yield data at the village level. In some cases, calculated thresholds may render farmers ineligible for claims even when substantial crop losses occur.

(d) Delayed Crop Cutting Experiments (CCEs): Farmers express dissatisfaction with the delay in CCEs, impacting the timeliness and accuracy of insurance claim settlements. Limited CCEs may fail to capture the scale and variety of crop losses.

(e) Limited Crop Coverage: Farmers are dissatisfied with the coverage of crops under insurance contracts, leading to concerns about the adequacy of protection.

(f) Premium Paying Capacity: Some farmers face challenges due to their limited capacity to pay insurance premiums.

(g) Lack of Land Records: Farmers encounter difficulties in accessing crop insurance due to issues with land records, especially for tenant farmers who lack formal lease documents.

(h) Documentation Complexity: Uneducated farmers find the documentation procedure for crop insurance complicated, and inadequate support from bank officials exacerbates the problem.

(i) Delay in Claim Settlement: Delayed claim settlements diminish farmers' faith in crop insurance as an effective risk mitigation tool during crop failures.

(j) Reliance on Government Relief: Farmers tend to rely more on government disaster relief/aid during catastrophic events than on availing crop insurance.

VI. Conclusion:

In conclusion, the findings of this study underscore the critical need for targeted interventions to enhance farmers' participation in crop insurance programs. To address the identified challenges, it is recommended that regular workshops be organized in rural areas, fostering collaboration between banks and beneficiaries to elevate insurance awareness among farmers. Additionally, a pivotal aspect involves expediting the settlement of insurance claims, which will contribute significantly to building trust and confidence in the insurance process.

Embracing technology is imperative, and the study advocates for the increased use of advanced tools such as drones and satellite imagery. These technologies can facilitate swift and accurate damage assessments in the aftermath of crop failure, expediting the claims process and providing timely support to farmers.

Furthermore, a strategic reduction in premium subsidies should be considered, promoting a more sustainable and equitable approach to crop insurance. This measure can encourage a more active role from farmers while ensuring the long-term viability of insurance programmes.

Finally, there is a pressing need for timely notifications regarding insured crops for specific harvesting seasons. Ensuring that farmers receive this information in a timely manner will empower them to make informed decisions and participate more effectively in crop insurance schemes.

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