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RESEARCH ARTICLE

Adoption of Crop Insurance by Smallholder Farmers: Farm-Level Evidence from India

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ABSTRACT

The paper aims to analyse the extent and determinants of smallholder farmers' adoption of crop insurance. The study conducted a primary survey and collected data from farmers in a drought-prone area of Karnataka state in India using a structured questionnaire. The study has applied a binary logistic regression model to identify the determinants of crop insurance adoption. Empirical results reveal that though most farmers experienced crop loss, only a small percentage subscribed to crop insurance regularly. Lack of money to pay premiums and lack of information are the most common reasons for not subscribing to crop insurance schemes. Further, farmers feel the premium is expensive and do not receive the promised compensation due to the stringent eligibility rules. Most farmers who received compensation think the money is inadequate to cover the cultivation cost. Farmers feel each farm should be treated as a unit against the area-based insurance concept, and more crops should be brought under insurance. They also highlighted the need to further subsidise the premium. Results of the logistic regression confirm that socially marginalised groups and farmers practising agriculture as an ancestral profession are less likely to insure their crops.

Keywords: Crop Insurance; Logistic Regression; Pradhan Mantri Fasal Bima Yojana (PMFBY); Small Holder Farmer

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1. Introduction

Insurance as a financial intermediation is very successful in various areas like life, health, assets, travel, etc. However, its success in agriculture is much less due to the very high risk for the insurance companies, and without reinsurance, private crop insurance markets are likely to fail^[1]. Farmers perceive the insurance premium as very high^[2], leading to a lack of willingness to pay for crop insurance^[3]. Lack of awareness among farmers is also one of the prominent reasons for the lesser adoption of crop insurance^[4]. In the Indian context, low compensation payouts by companies in the event of crop loss were found to discourage farmers from opting for crop insurance^[5]. A commercially viable crop insurance scheme is highly desired not just in India but globally as well for improving the welfare of farmers^[6], enhancing productivity in agriculture^[2] and encouraging the farmers to go for specialised cropping^[7].

For the successful adoption of crop insurance, it is necessary to give periodic training to farmers^[8]. Even when there is a willingness to adopt crop insurance, farmers are willing to pay only a small percentage of the actuarial premium^[9, 10]. Most farmers prefer comprehensive insurance over weather index- or area-based insurance^[11-13]. However, experience suggests that it is very difficult to achieve in making crop insurance financially viable and socially sensitive. Even in the countries of the global north, crop insurance is either in the hands of the government or the premiums are subsidised^[8]. India is not an exception to this.

India, with a population of around 1.4 billion, is the most populous country in the world and the seventh-largest in terms of area, with about 3.28 million square kilometres. A natural outcome of this is the population's food requirement and the availability of land for cultivation. Agriculture and allied activities contribute more than 70 percent of the livelihood and nearly 15 percent of the Gross Domestic Product (GDP). India is the largest producer of milk and pulses, and the second largest producer of rice, wheat and other products. India has varied climate conditions, which makes it very vulnerable to the vagaries of the climate.

Agriculture is a major source of livelihood for people in rural areas in India. More than 80 percent of

farmers in India own less than two hectares and fall under the category of 'small and marginal' farmers. Agriculture, in general, and small and marginal farmers, in particular, will face much crop risk due to reliance on nature. As small and marginal farmers have fewer resources and limited access to credit from formal lending sources, they find it difficult to absorb the shocks or take preventive measures at the prospect of crop loss.

To mitigate this problem, drawing from experience, the Government of India has launched a nationwide crop insurance program, namely, Pradhan Mantri Fasal Bima Yojana (PMFBY), in February 2016. It aligns with the One Nation One Insurance scheme by incorporating the good features of earlier insurance schemes and overcoming the shortcomings. This study undertook the task of the impact evaluation of PMFBY. For this purpose, the study collected farm-level data using a structured questionnaire in drought-prone areas of Karnataka. Socioeconomic information and PMFBY-related questions were asked to the respondents. Data analysis uses frequency distribution based on queries and a logit regression model. Results confirm that there is widespread crop loss due to climatic reasons. However, only a small percentage of farmers enrol for PMFBY regularly. Not having adequate financial resources to pay crop insurance premiums, lack of awareness, stringent rules governing crop insurance, and expensive premiums are the major reasons for not availing crop insurance. Farmers who enrolled for crop insurance have received the compensation at least once. However, they did not receive compensation every time they lost crops. Logit model results confirm that farmers from socially marginalised groups and those practising agriculture as an ancestral profession are less likely to avail of crop insurance. The remainder of the paper is organised as follows: Section 2 explains the objectives and features of PMFBY, and Section 3 deals with the literature review; materials and methods are presented in Section 4, followed by the results in Section 5; finally, Section 6 discusses the findings and conclusions are provided in Section 7.

2. Pradhan Mantri Fasal Bima Yojana (PMFBY)

Pradhan Mantri Fasal Bima Yojana (PMFBY) is a national-level insurance scheme that was introduced in

the Kharif season of 2016 to sustain agriculture production by providing an affordable crop insurance product and to mitigate the loss from contingencies due to the non-preventable natural risk from pre-sowing to post-harvest period.

The primary objectives of the scheme are as follows:

- a) Ensuring compensation for farmers who suffer loss due to damage to the crops from events which cannot be prevented from happening;
- b) Providing stability to farmers' income and ensuring that farmers continue in their profession;
- c) Emboldening farmers to adopt innovative and modern agricultural practices;
- d) Securing farmers credit worthiness, encouraging farmers to diversify crops, encouraging growth in the agricultural sector and enhancing the sector's overall competitiveness.

PMFBY provides comprehensive insurance coverage against crop loss and covers all food crops and oilseeds. It also covers commercial, horticulture and other crops. The difference between the actuary premium and the actual premium paid by the farmers must be equally shared by both central and state governments. The basis for implementing the scheme is an 'area approach basis'; thus, all assessments concerning the loss of crops due to unforeseen events shall be carried out on an area basis only. Three levels of indemnity are available for corresponding crop risk in the particular area for all crops. Indemnity level may range from 70% to 90%.

PMFBY replaces all other existing agricultural insurance schemes. As the program has already crossed five agricultural crop seasons, it may be a good time to begin the evaluation of the PMFBY to fulfil its objectives and identify any pitfalls in its implementation. Though several studies have examined the earlier agricultural crop insurance programs in India, to the best of my knowledge, no study has examined the performance of the PMFBY. As Indian agriculture largely relies on rainfall, the vagaries of the climate greatly impact farmers' livelihood. Therefore, there is a compelling need to examine the impact of PMFBY on farmers' livelihoods.

PMFBY attempts to build on experience and pro-

vide a viable insurance scheme. Evidence from the field shows that it is fairly successful in giving compensation in the event of crop loss. However, the expectation of farmers far outweighs the present delivery. There is much more to be done to achieve its stated objectives. The most significant is to take the message to the last farmer standing. There is a strong need to educate the farmers about the scheme's functioning and to update it based on farmers' feedback.

3. Literature Review

This section reviews the studies in the global and Indian contexts separately. The study confines the review of extant studies on the willingness to pay and adopt crop insurance globally and the evaluation of various crop insurance programs in the Indian context.

3.1. Studies in Global Context

Studies in the global context have examined a wide variety of issues concerning crop insurance. Issues like scope for crop insurance, feasibility, design of insurance product, willingness to pay (WTP) for crop insurance, pricing and impact of crop insurance on farmers are prominent. In the context of developing countries, Hazell^[14] argued that several risks to agriculture are complex and make it difficult to insure such risks at reasonable rates. Echoing the same sentiment, Miranda and Glauber^[1] argued that private crop insurance markets are most likely to fail without effective reinsurance due to the high correlation between farm yields and weather events. Taking the argument further, Smith and Watts^[3] argued that the basis risk and farmers' WTP for crop insurance mainly determine its feasibility, scalability and sustainability.

Types of crop insurance and product design also received attention in the extant literature. Ye et al.^[12] examined the effectiveness of area yield crop insurance (AYCI) and farm yield crop insurance (FYCI). Based on the Chinese farm-level data, the study argued that FYCI is the preferred form compared to AYCI considering the higher basis risk involved in AYCI. Once again, in the Chinese context, Huang et al.^[13] observed that farmers prefer agricultural insurance covering many risks, including

price drops and input cost risks, instead of only climate risks. In the context of the USA, Zhou, Li and Pai^[15] argued that rainfall index-based insurance is better for reducing the moral hazard problem than yield-based insurance.

WTP and crop insurance pricing have received particular attention from researchers. A study by Budiasa et al.^[10] in the Indonesian context estimated the WTP at 34 percent of the actuarial premium. The study argued that estimating WTP is necessary to reduce the government's subsidy burden and ensure the adoption of crop insurance by a large proportion of farmers. A similar study by Ngoc Que Anh, Thanh Binh and Dang Thuy^[9] in the context of Vietnam estimated the WTP within the range of 10 to 25 percent of the actuarial premium. Similarly, a study by Ali et al.^[16] examined the WTP in the context of Togo and estimated the WTP at \$14.5 per hectare.

A study by Budhathoki et al.^[4] in Nepal documented that farmers were willing to pay nearly three times the actuarial crop insurance premiums. However, the government of Nepal subsidises almost 75 percent of crop insurance. Though the finding is quite contrasting to other evidence on WTP, it highlights the importance of conducting such studies while deciding crop insurance pricing. Maisashvili et al.^[17] compared over 1900 crop insurance policy premiums with standard actuarial premiums. The study concluded that the premiums were inconsistent with valid probability distributions for nearly one-third of schemes. This once again highlights the issue of crop insurance pricing.

Several studies have examined the scope for and the impact of crop insurance schemes. Aidoo et al.^[8] examined the scope for crop insurance in Ghana. Most farmers were willing to adopt it as a risk management tool, and willingness to adopt it was determined by socioeconomic factors. Similarly, Afriyie-Kraft, Zabel and Damnyag^[18] examined the potential for weather-based insurance in Ghana. The study found that nearly 90 percent of farmers are interested in availing of such insurance, and several socioeconomic variables determined the intention to adopt. While examining the impact of crop insurance, Le et al.^[19] argued that the moral hazard problem is a major issue in the case of crop insurance premiums deeply subsidised by the government.

The study documented farmers' excessive use of fertilisers and herbicides with crop insurance. Further, a theoretical study by He et al.^[20] argued that the positive marginal effects outweighed the negative moral hazard problem and advocated for the adoption of crop insurance.

Several studies examined the significance of crop insurance to agriculture. A study by Kim, Yu and Pendell^[21] argued that crop insurance reduces farm exits and disinvestments. The study has highlighted the importance of crop insurance for the viability of agriculture. Further, a study by De Nicola^[22] quantified a 17 percent permanent increase in consumption due to crop insurance. This finding has shown crop insurance's potential to increase farmers' welfare. Similarly, Carter et al.^[2] observed that the lack of crop insurance hinders productivity growth and agricultural investment.

A study by Pasaribu^[23] highlighted the need for coordination among insurance companies, the government, and farmers to design and implement successful crop insurance. Nyaaba, Nkrumah-Ennin and Anang^[24] argued that there is less awareness among farmers about crop insurance in the context of Ghana. Several socioeconomic factors influenced the awareness.

The review of studies in the global context reveals a need for crop insurance in both the global south and the global north due to excessive weather events. Further assessing the WTP and pricing of the insurance is very critical for the success of the crop insurance program. Insurance adoption positively affects farmers in particular and agriculture in general. Crop insurance is also found to have a moral hazard problem, but the positive effects of insurance adoption outweigh the negative.

3.2. Studies in the Indian Context

In the Indian context, the importance of crop insurance, the design of insurance products, determinants of crop insurance adoption and impact assessment are the major themes of extant studies. Dandekar^[25] appears to be the first economist to have stressed the importance of crop insurance. The study has argued that the role of crop insurance is paramount due to agriculture's reliance on monsoon, which is known to vary greatly. The author has argued that crop insurance is very important,

especially in drought-prone areas and areas known for frequent crop failures.

Regarding crop insurance design, Vyas and Singh^[26] comprehensively analysed the National Agricultural Insurance Scheme (NAIS) and suggested changes to the policy to make it effective. The study has made several observations based on the findings. First, crop insurance should be kept separate and not clubbed with other insurance for farmers' assets or income. Second, insurance should be compulsory for all farmers, irrespective of the size of the holdings. Third, crop insurance should be for all crops and across all regions. Further, Sinha^[27] analysed the comprehensive agriculture insurance in India, which includes various government efforts like crop insurance, minimum support prices, and natural calamity relief funds. The study observed that crop insurance covers only 10 percent of crops, and structural weaknesses exist in the insurance product design and delivery.

Singh^[28] examined the issue of crop insurance in the context of India. Considering the production risk based on climate and market risk due to vagaries in the prices of agricultural products, crop insurance is essential for handling production risk. The study has analysed NAIS and Weather Based Crop Insurance Scheme (WBCIS) by pointing out the advantages and disadvantages of both schemes. Nair^[29] analysed the NAIS in India. The study observed that the scheme has several lacunas in coverage and liability payments that are biased in favour of a few regions. In addition to that, the scheme has substantial delays in settling the claims. Compared with the NAIS, WBCIS overcomes several problems of the former. Therefore, the study has argued that the two schemes should be treated as complementary products rather than competing.

Varadan and Kumar^[7] assessed the impact of crop insurance on rice cultivation in Tamil Nadu state in India. The study found that crop insurance has absorbed the production-related risk and encouraged farmers to go for specialised cropping. The study has found that crop insurance adoption depends on the education level of farmers, access to formal sources of credit, non-agricultural income, and other factors. Clarke et al.^[11] examined the weather index-based insurance market in

India. The study has observed that weather index-based insurance should be based on sound agronomic principles. Further, instead of a single weather index-based product, there should be hybrid insurance that combines weather index-based insurance and yield-based insurance.

Swain^[30] assessed the role of crop insurance for adaptation to climate change in Odisha, India. The author evaluated the performance of the NAIS and pilot WBCIS, which were under implementation at the time of the study. Based on a time series data analysis and focus group discussion, the study observed that the WBCIS performs better than NAIS due to higher coverage in terms of the insured amount, larger number of farmers being covered, small premium, and faster and timely payment of the compensation to the insured. Senapati^[31] examined crop insurance adoption in coastal and rainfed agriculture areas of Odisha in India. The study examined both adoption and willingness to pay using the Probit model. The study argued that past crop insurance purchase history significantly influences future adoption, and therefore, companies should examine the same. Further, the crop insurance sum assured was also found to influence farmers' adoption of crop insurance.

Cariappa et al.^[5] examined the factors influencing the adoption of crop insurance in India and its impact on farmers' debt and income using a nationally representative sample. The study has used the National Sample Survey Office (NSSO) data and applied logit model and propensity score matching techniques. The study found that only 5 percent of farmers availed of crop insurance in India, and out of that, nearly 87 percent of farmers have failed to receive claims for crop damage. The study also found that households with large family sizes, less education, and belonging to lower socioeconomic groups are excluded from the crop insurance network.

The studies in the Indian context have documented the importance of crop insurance and lacunas in the earlier implemented crop insurance products. Therefore, the present study's findings can put things into perspective regarding the features and findings of PMFBY.

4. Material and Methods

The present study mainly uses primary data collected specifically for this study. A structured questionnaire was drafted, and field investigators were trained to execute the same. Face-to-face interviews were conducted with the respondents. The study used a non-probability sampling technique. Convenience sampling and snowball sampling methods are used. Because of COVID-19 and general fear of farmers disclosing financial information, village leaders were contacted first and explained the nature of the study. After gaining the confidence of the village leaders, they convinced the farmers in the area to participate in the survey. Further, several farmers referred their neighbours, friends, and relatives to give responses. Data was collected from all farmers, both those who availed of the benefits of the crop insurance scheme and those who did not. This study's sample consists of farmers actively engaged in farming. The time frame of the data collection was January to May 2022.

The study area is confined to Karnataka and covers three agro-climatic zones. There are 10 agroclimatic zones viz. North Eastern Transition Zone, North Eastern Dry Zone, Northern Dry Zone, Central Dry Zone, Eastern Dry Zone, Southern Dry Zone, Southern Transition Zone, Northern Transition Zone, Hilly Zone, and Coastal Zone. The field survey is conducted in the North Eastern Transition Zone, North Eastern Dry Zone, and Northern Dry Zone. All the three agroclimatic zones fall under the drought-prone area in Karnataka and have experienced drought in the last five years. Therefore, it suits the requirement of the study as the farmers in these zones have experienced crop loss in the recent past. Such farmers will be in a better position to decide on the adoption of crop insurance program. Four hundred responses are collected from three agroclimatic zones. However, after screening for completeness, the study used 385 responses and rejected 15 responses.

The present study has asked a total of 66 questions to the respondents. The topics of these questions range from personal details of the respondents, various socioeconomic variables, questions relating to farming, and questions explicitly relating to PMFBY. The responses of farmers to some of these questions will be presented in

summary tables with frequency distribution, percentage and other classifications. Further, the logistic regression model is estimated to identify the determinants of the adoption and intention to adopt crop insurance.

The study proposes to use logistic regression to assess the determinants of crop insurance adoption. The dependent variable (Y) in Equation (1) is a categorical variable with two nominal outcomes. If a household has adopted crop insurance, it is coded as 1 and 0 otherwise. The model is specified as follows:

$$\begin{aligned} \text{Availed Crop Insurance (Yes = 1; No = 0)} = & \\ \alpha_0 + \beta_1 \text{Highest Education} + \sum \beta_2 \text{CasteGroups} & \\ + \beta_3 \text{Primary Occupation Dummy} + & \\ \beta_4 \text{Size of Land Holding} + & \\ \beta_5 \text{Crop Damage Dummy} & \end{aligned} \quad (1)$$

Among the independent variables, the highest education represents the highest number of years of education received by a household number. To test the impact of caste group on availing crop insurance, caste group is added as an independent variable. The size of land owned in terms of acres is considered to assess the impact of land holding size on crop insurance adoption. Whether agriculture is the primary occupation of the household or not is captured using primary occupation dummy. Finally, whether a household has experienced crop damage in the last five years is used as a dummy. It takes the value of 1 if the household has experienced crop loss and 0 otherwise.

5. Results

The empirical results of the study are presented in this section. Agriculture being a traditional occupation, the socioeconomic variables are expected to play a major role on the status of agriculture. The level of education of farmers, the extent of land ownership, dependency on agriculture, etc., play a crucial role. Therefore, it is necessary to examine the same.

Table 1 presents the socioeconomic and crop loss information in the study area. About education, nearly 10 percent of the households do not have any formal education. Over 20 percent of households each have up to 10 standard and Pre-University (PUC) education. It

is observed that the highest percent (43.38 per cent) of households have at least one member receiving undergraduate or above education. A relatively small percent of households have post-graduation and professional education. Concerning land ownership, about 68 percent own less than five acres, and another 19 percent own less than 10 acres of land. Therefore, the sample drawn should adequately represent the smallholder farmers. A question was asked to find whether agriculture is the main or primary occupation of the households. For nearly 93 percent of the respondents, agriculture is the main occupation. Therefore, they will be very vulnerable to crop loss or market failure, which can push households to poverty. Households were further asked to specify whether they have any non-agricultural source of income which can provide some cushion if the agricultural income is less in a given year or season. Nearly 25 percent of the respondents have non-agricultural sources of income; whereas almost 72 percent did not have such a cushion.

Table 1. Socioeconomic and crop loss information.

Variable	Frequency	Percent
Level of education		
Not educated	37	9.61%
Up to class 10	98	25.45%
PUC (10+2)	83	21.56%
Under graduation & above	167	43.38%
Area of land owned		
Five and less	260	67.53%
10	75	19.49%
15	21	5.46%
20 and more	29	7.54%
Agriculture as the main occupation		
Yes	358	92.99%
No	10	2.60%
Not disclosed	17	4.42%
Non-agriculture income		
Yes	95	24.68%
No	279	72.47%
Not disclosed	11	2.86%
Crop loss in preceding five years		
Yes	374	97.14%
No	5	1.30%
Not disclosed	6	1.56%
Reasons for crop loss		
Flood	12	3.12%
Drought	269	69.87%
Other climate conditions	72	18.70%
Pest	223	57.92%
Lack of irrigation	112	29.09%
lack of electricity	104	27.01%

One of the major reasons for promoting crop insur-

ance is crop failure due to natural calamities or other incidents which may damage the crop. Therefore, farmers were asked whether they experienced crop loss in the preceding five years. As explained in the study area profile, the areas chosen for the survey are drought-prone districts in Karnataka. Therefore, it is most likely that the farmers might have suffered crop loss in the last five years. This assumption is overwhelmingly supported by empirical evidence from the ground, with nearly 97 percent of farmers having experienced crop loss in the preceding five years. Therefore, the study area is ideal for testing the PMFBY and its role in reducing the farmers' distress. Farmers were further asked to elaborate on the reasons for the crop loss. Drought is the most commonly cited reason, with nearly 70 percent of farmers saying that they experienced crop loss due to this. This is closely followed by pest attacks at 58 percent, lack of irrigation at 29 percent, lack of electricity at 27 percent and other climatic conditions localised in nature. Since crop failure can happen for multiple reasons, farmers were allowed to choose multiple reasons, and therefore, the percentage did not add up to 100.

Table 2 presents the details about subscribing to PMFBY and claims-related information. Nearly 18 percent of farmers said they have subscribed to the scheme, and almost 82 percent have not.

Farmers were asked about the reasons for not availing of the PMFBY. The most dominant reason is not having adequate money to pay the premium, which is at nearly 55 percent. The following important reason is not being aware of the crop insurance scheme, which is at about 26 percent. Premium being too expensive and stringent rules are some of the other reasons cited by the farmers for not availing of the scheme. A small fraction of farmers also said that this scheme is not helpful for farmers and complained that they never got the promised money. The reasons for not availing of crop insurance align with the literature. For example, Carter's^[2] argument that expensive premium is a prominent reason for the failure of crop insurance is reflected in farmers' responses in the Indian context as well. Further, the study corroborates the Budhathoki^[4] findings about the lack of awareness about the scheme.

Farmers were enquired about their experience of

Table 2. Pradhan Mantri Fasal Bhima Yojana (PMFBY) enrollment- and claims-related information.

Variable	Frequency	Percent
Whether availed PMFBY		
Yes	71	18.44%
No	314	81.56%
Reasons for not availing PMFBY		
Not aware of crop insurance	99	25.71%
Inadequate money to pay premium	210	54.55%
Premium is expensive	46	11.95%
Insurance not helpful for farmers	22	5.71%
Never got promised money	15	3.90%
Rules are too stringent	49	12.73%
Experience of claiming PMFBY		
Received compensation without much difficulty	6	8.45%
Delay in receiving compensation	21	29.58%
Cumbersome procedures	21	29.58%
Faced difficulty in receiving compensation	11	15.49%
Not disclosed	12	16.90%
Adequacy of PMFBY claim		
Yes	6	8.45%
No	65	91.55%
Reasons for not receiving PMFBY claim		
Crop not covered under PMFBY	10	17.24%
Area not eligible	48	82.76%

receiving compensation from PMFBY. Only about eight percent of farmers said they did not face any difficulty in obtaining compensation, as against an overwhelming majority of 75 percent stating one or other difficulty in getting compensation. Delays in receiving compensation and cumbersome procedures are the most commonly cited reasons. Finally, about 17 percent of farmers did not disclose any opinion on whether they faced difficulty.

Farmers were asked about the adequacy of compensation received to cover the expenses. An overwhelming 92 percent claimed that the amount of compensation was insufficient to cover the costs, against only eight percent agreeing that it is adequate. It may be noted that the cost structure of different farmers may be different considering the extent of family labour used and other localised factors. Therefore, some farmers found it sufficient to cover the expenses, but a large fraction did not find it sufficient. Based on this response, it may be argued that the compensation is generally insufficient. Even though almost all farmers received compensation under PMFBY at some point, not all farmers re-

ceived compensation at all times when they lost crops. Therefore, they were asked why they did not receive compensation. About 17 percent of farmers said the PMFBY did not cover the crop loss. However, the major reason is that the area is not declared eligible for compensation at about 83 percent. This is because the PMFBY is area-based insurance; crop loss of a few individual farmers will not make them eligible for receiving compensation. Therefore, policymakers need to pay attention to this fact.

Table 3 presents the results of the logistic regression model on factors influencing the adoption of PMFBY.

The first independent variable is the highest adult education in the family. It is based on the reasoning that most of the decisions will be taken by the adult members of the family, and if they have a good education, they will be in a position to make informed decisions. Therefore, one can expect a positive impact of education on the adoption of PMFBY. However, the variable's odds ratio and marginal effect are statistically insignificant. Another factor that may influence the deci-

Table 3. Logistic regression result on adoption of Pradhan Mantri Fasal Bima Yojana (PMFBY).

Independent Variables	B	Exp (B)	Sig.	dy/ dx	Sig.
Highest adult education	-0.09	0.91	0.50	-0.01	0.742
Caste group-general base category			0.00		
Caste group-SC	-20.00	0.00	1.00	-0.16	0.023
Caste group-ST	-1.54	0.22	0.00	-0.15	0.022
Caste group-OBC	-1.43	0.24	0.00	-0.15	0.007
Ancestral profession dummy	-0.84	0.43	0.06	-0.12	0.053
Land ownership in acres	0.02	1.02	0.57	0.00	0.406
Crop loss dummy	0.18	1.20	1.00	0.00	0.826
Constant	-20.22	0.00	1.00		

Note: Nagelkerke R Square = 0.269; 80.4 percent of correct classification.

sion to adopt PMFBY is the caste group. Since multiple groups exist, it is adopted as a categorical variable with 'general category' as the base and other categories compared with the base category. The table shows that the coefficient of 'scheduled caste' is statistically insignificant. However, the negative marginal effect coefficient is significant. It indicates that a farmer being scheduled caste reduces the probability of availing crop insurance. As far as 'scheduled tribe' and 'Other Backward Classes' (OBCs), coefficients and marginal effects are negative and statistically significant. It shows that farmers of these caste groups have less chance of availing of PMFBY than the reference category 'general'. This finding is on the expected lines considering the social structure in India. Whether agriculture is an ancestral profession is the second dummy variable, with 'no' being the reference category. The coefficient and marginal effect are negative and statistically significant, showing that farmers for whom agriculture is an ancestral profession are less likely to adopt PMFBY than those farmers for whom it is not. This may be because such farmers are more experienced and know how to handle the difficulty caused by crop loss than farmers who are new to the profession. Further, those practising agriculture as an ancestral profession would have inherited the land. On the other hand, new farmers would have purchased land and made significant investments. Not insuring crops may be riskier for such farmers than those who practice it as an ancestral profession. The coefficients of the number of acres of land owned and the dummy variable representing crop loss are not statistically significant. Finally, the Nagelkerke R Square is 0.269, and the model has correctly classified 80.4 percent of cases.

6. Discussion

Results of the study indicate that the farmers are fairly educated in the study area. Further, they depend on farming as a primary occupation and do not have non-agriculture income. This makes them particularly vulnerable to crop loss. Since the study area is drought-prone, most farmers have lost crops, and drought is the primary reason for the crop loss. A small portion of farmers avail of crop insurance regularly. Lack of awareness, expensive premiums, and not having money to pay premiums are the primary reasons for not availing crop insurance. These findings are similar to those of Carter, de Janvry and Sadoulet^[2], Smith and Watts^[3], Nyaaba, Nkrumah-Ennin and Anang^[24], as well as Cariappa et al.^[5]. Perceived expensive premiums also point to the ability to pay and WTP. This corroborates the findings of Ngoc Que Anh, Thanh Binh and Dang Thuy^[9], Budiasa et al.^[10], as well as Afriyie-Kraft, Zabel and Damnyag^[18]. Those who received compensation faced difficulty in getting the compensation, highlighting issues in delivery^[27]. Non-coverage of specific crops and areas not being declared as eligible for receiving compensation are the reasons for not receiving compensation despite facing crop loss. This is similar to the findings of Ye et al.^[12], which documented a preference for farm yield crop insurance compared to area yield crop insurance. Finally, there is a socio-economic dimension to the farmers' problems. Socially marginalised groups and traditional farmers are less likely to subscribe to crop insurance. This is similar to Nyaaba, Nkrumah-Ennin and Anang's^[24] findings on socioeconomic influence on crop insurance awareness and adoption. Since the study has

adopted a non-probability sampling method, it is not easy to generalise the findings of this study.

7. Conclusions

The study analyses the adoption of crop insurance by smallholder farmers based on farm-level data about a drought-prone area of Karnataka in India. It conducted face-to-face interviews with farmers using a structured questionnaire. The empirical results of the study reveal that most farmers have experienced crop loss in the recent past. However, a very small percentage of farmers have availed of crop insurance regularly. Inadequate money to pay premiums and lack of information about the crop insurance program are the prominent reasons for not availing crop insurance. Farmers also feel that the premium is too expensive compared to the promised benefit, and sometimes, even the promised benefit is not received after the crop loss. Logistic regression results reveal that farmers from socially marginalised groups and farmers for whom agriculture is an ancestral profession are less likely to avail of crop insurance benefits.

The empirical results of the study lead to several policy implications. Farmers feel that the present concept of area-based insurance should be removed, and each farm should be treated as a unit eligible for compensation. Further, there is also a need to bring more crops under the ambit of insurance and further subsidise the premium. It is also necessary to educate the farmers on different features of the crop insurance program to convince them of its utility in the presence of climate change-induced extreme weather events.

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Institutional Review Board Statement

Not applicable.

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Not applicable.

Data Availability Statement

The study is based on primary data collected for this study. It is not available in any public domain.

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Conflict of Interest

The author disclosed no conflict of interest.

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