Factors Affecting Crop Insurance Demand in Tripura: A Study of Sepahijala District

Anindita Sinha, Pradip Chouhan and Tanmoy Deb

Research Journal of Agricultural Sciences
An International Journal

P- ISSN: 0976-1675
E- ISSN: 2249-4538

Volume: 13
Issue: 06

Res. Jr. of Agril. Sci. (2022) 13: 1794–1801

CARAS

Res. Jr. of Agril. Sci. (Nov-Dec 2022)
13(6): 1794–1801

ISSN: 0976-1675 (P)
ISSN: 2249-4538 (E)

www.rjas.org

Full Length Research Article

Factors Affecting Crop Insurance Demand in Tripura: A Study of Sepahijala District

Anindita Sinha*[1], Pradip Chouhan[2] and Tanmoy Deb[3]

Received: 01 Sep 2022 | Revised accepted: 06 Nov 2022 | Published online: 03 Dec 2022

A B S T R A C T

The Government of India has launched the Pradhan Mantri Fasal Bima Yojana, a crop insurance scheme that subsidizes the premium and promises to settle claims timely. Tripura is a state where 65 to 70 per cent of people earn their livelihood from the agricultural sector. The present paper tries to determine the extent of crop insurance coverage in the state under the Pradhan Mantri Fasal Bima Yojana, and also examines the determinants of crop insurance demand, highlighting the effect of climate change. The study is largely based on primary data collected through cluster random sampling techniques. Standard statistical tools are used to analyze the primary data. Moreover, a binary logistic regression has also been carried out to examine the determinants of crop insurance demand in Tripura. The study finds that only 24 per cent of the farmers are willing to take crop insurance. The results also show that farm income, coverage period wanted, climate change and risk perception are significant factors associated with crop insurance.

***Key words*:** Climate change, Crop insurance, Pradhan Mantri Fasal Bima Yojana, Risk perception, Tripura

Even though Tripura has been primarily an agrarian state, its relative contribution to India's total agricultural output is negligible. The share of agriculture to the gross state domestic product (GSDP) of Tripura is approximately 40 per cent, and households dependent on agriculture for livelihood are about 42 per cent. Out of the total geographical area of the state, only 27 per cent is cultivable land [7]. Average operational land holding is the lowest in Tripura among all North-eastern states (0.43 hectares), and along with it, the operational holdings are primarily fragmented and dominated by marginal farmers [13]. The Scheduled Tribes (STs) live in hill areas, while the non-ST population reside in the plains. The development of the hills depends largely on improving agriculture and allied activities [23]. In rural areas, all households practice farming to pursue their livelihood. Nonetheless, agriculture is highly seasonal depending on weather conditions [9]. The farmers continue to meet various challenges of poor infrastructure, unfavourable policies, and poverty, affecting agricultural productivity. Recently, climate change has become a significant threat to agrarian cropping patterns, thus affecting small and marginal farmers negatively [28].

* **Anindita Sinha**
✉ sinhaanindita3@gmail.com

[1] Department of Economics, Tripura Government Law College, Agartala - 799 004, Tripura, India

[1-3] Faculty of Management and Commerce, ICFAI University Tripura, Agartala-Simna Road, P.O. Kamalghat, Mohanpur, Agartala - 799 210, Tripura, India

Natural calamities like droughts, floods, cyclones, storms, landslides, and earthquakes frequently impact India's agricultural production and farm income. Farmers are negatively affected by man-made calamities such as fires, the sale of fake seeds, fertilisers, pesticides, price falls, etc. According to the National Agriculture Policy 2000, "Despite technological and economic advancements, the condition of farmers continues to be unstable due to natural calamities and price fluctuations". In some extreme cases, these unfavourable events become one of the factors leading to farmers' suicides [29].

Literature shows that farmers' losses reveal an increasing trend due to uncertainty in agriculture production. However, the minimum support prices (MSP) for crops offer some degree of income security to a segment of the farming sector. But the fact is that MSP only covers a small number of crops, and the procurement system in the east of the country is subpar. Thus, agricultural insurance is a crucial tool for addressing physical risk in terms of yield and money [30]. One strategy used by farmers to maintain farm income and investment and protect against the catastrophic effects of losses caused by natural disasters or low market prices is agricultural insurance. Offering farmers, a minimal level of protection lessens the impact of crop losses.

In India, crop insurance first surfaced in 1920 [22]. Since independence, efforts have been made at the national and state levels to devise and implement a crop insurance programme for farmers. After independence, the first crop insurance scheme was started in 1972, and the latest Pradhan Mantri Fasal Bima Yojana was launched on 13th January 2016. Moreover, the perception of crop insurance in India is not as encouraging as

farmers have very little knowledge of crop insurance programmes [8], and a meagre percentage of farmers have been found aware of the crop insurance schemes [18], [31-32] and adoption crop insurance is poor [2]. Further, farmers believe these programmes are not widely known, express dissatisfaction for fraudulent practices, and cannot receive a sufficient claim amount [5]. Moreover, the adoption of crop insurance depends on age, education and agriculture income; younger farmers who own more land use crop insurance more frequently [4]. The size of the land holding and premium subsidies were also found to improve the likelihood that farmers will purchase crop insurance, and tenants and farmers from lower castes are less likely to buy crop insurance [2]. Under some circumstances, farmers value crop insurance, and some are willing to pay a premium over the subsidized rates they are now compelled to pay for this programme. Farmers, in particular, value the assurance that they will receive timely payouts when they suffer losses, even though they may not have a strong fondness for the approach used to calculate losses [10].

Moreover, a study on the PMFBY in India reveals that approximately 26 per cent of farmers were covered under the scheme till 2017. The leading causes of crop insurance's low penetration are a lack of awareness among farmers, delays in claim settlement, an insufficient number of channels, and a lack of knowledge of farmers' risk-taking behaviour. However, the PMFBY has reduced and standardized premium rates and emphasized the use of technology. The paper argued that to reach the intended coverage of crop insurance in India, other structural obstacles must be overcome [33]. With the context above in mind, this article attempts to analyze the level of crop insurance coverage in the state of Tripura. It examines the factors that influence crop insurance demand while stressing the impact of climate change.

MATERIALS AND METHODS

One of Tripura's newest districts, Sepahijala District, was carved out of West Tripura District and had a total area of 1043.58 sq km. It shares a 99.286 km international border with Bangladesh, of which 9.2 km are unfenced. According to the Census of 2011, Sepahijala District has a population of 542731 people, 275968 of whom are male and 266763 of whom are female. The district's literacy rate is 98.00 per cent, and the sex ratio is 966. Paddy is the primary crop grown in the Sepahijala District. Seasonal crops such as maize and flour, potatoes, cabbage, radish, vegetables, legumes, oil-seeds, pineapples, and other fruits are also grown. Many district areas are used to grow cash crops like rubber and tea.

Sampling and method of estimation

Cluster random sampling was used to gather the primary data for the current study. By creating a questionnaire and conducting interviews with farmers, primary data about the factors influencing crop insurance demand has been gathered. The sample size is 100.

Standard statistical methods were used to address the study's first objective, and a binary logistic model was used to manage the second goal. Since the dependent variable is categorical, having a binary outcome of 0 and 1, and the independent variables contain both continuous variables as well as categorical variables, binary logistic regression has been regarded as an appropriate model to accomplish the objective [6]. The equation can be used to express the binary logistic model's functional form (1).

$$Z_i = \ln\left[\frac{P_i}{1-p_i}\right] = \alpha + \beta X_{1i} + \gamma X_{2i} + \cdots + \delta X_{ni} + \varepsilon_i \quad \ldots\ldots (1)$$

Here, Zi is a log odds, α is constant, β, γ, δ are vectors of coefficients of independent variables (see table 1), X1i, X2i, …, Xni and εi is an error term for ith respondents. In the equation above, only the change in the dependent variable's log odds is calculated; the variable itself does not change. The logit equation can be transformed into odds ratio using the exponential function to make a simple understanding. The odds ratio's functional form can now be expressed as an equation (2).

$$\text{Odds ratio} = \left[\frac{P_i}{1-p_i}\right] = e^{(\alpha+\beta X_{1i}+\gamma x_{2i}+\cdots+\delta x_{ni}+\varepsilon_i)} \quad \ldots\ldots (2)$$

The odds ratio in this context refers to the ratio between the likelihood that a farmer will opt for a crop insurance policy and the likelihood that he or she won't. In the case of continuous independent variables, both the coefficients and the exponential coefficients are related to the effect of per unit change in the given independent variable to log odds and odds ratio, respectively. If the independent variable is dichotomous by nature, the exponential of the respective coefficient gives the proportion of change in odds for a shift in the given independent variable.

The following models have been estimated using binary logistic regression:

Model 1: *Crop insurance = f (Risk experience, change in temperature change, change in rainfall)*.

Model 2: *Crop insurance = f (Age, Education, number of children, Tenure as farmer, Primary occupation, Farm income, Coverage period wanted)* and,

Model 3: *Crop insurance = f (Age, Education, number of children, Tenure as farmer, Primary occupation, Farm income, Coverage period wanted, Risk experience, change in temperature change, change in rainfall*).

RESULTS AND DISCUSSION

Coverage of the scheme in Tripura

Every effective crop insurance programme across the world needs government funding and assistance. In 65 countries, a recent World Bank poll on crop insurance indicated that premium subsidies by the government were the most popular means of supporting the agricultural insurance market. Crop insurance is primarily a business operation, but governments frequently participate as well because they have a stake in preserving productivity and ensuring the well-being of the farming community [30]. The following table displays the PMFBY coverage in Tripura from year 2016–17 to 2019–20. As can be seen, there were 11782 farmers enrolled at the start of the programme, with 28.9% of them being loanees and the remaining 71.1% falling into the non-loanee category. Furthermore, 72% of the farmers who received loans used the facility for the Rabi crop, while 28% used it for the Kharif crop. The situation for non-loanees is nearly identical, with 89 percent of non-loanees taking advantage of the programme during the Rabi crop. The data's pattern indicates a similar path in the year 2017–18. Oddly, there were no farmers availing the scheme for growing the Kharif crop in the year 2018. In the year 2019, though, contrarily, more farmers who were cultivating Kharif crops were availing advantage of the benefits PMFBY.

Table 1 Extent of PMFBY during 2016-17 to 2019-20 in Tripura

Year		Loanee	Non-loanee
2016-17	Kharif	937(28%)	944(11%)
	Rabi	2465(72%)	7436(89%)
	Total	3402(100%)	8380(100%)

2017-18	Kharif	1961(30%)	359(7%)
	Rabi	4493(70%)	4859(93%
	Total	6454(100%)	5218(100%)
2018-19	Kharif	65(100%)	2049(100%)
	Total	65(100%)	2049(100%)
2019-20	Kharif	1917(57%)	27510(84%)
	Rabi	1467(43%)	5110(16%)
	Total	3384(100%)	32620(100%)

Source: Computed from EoT, 2020-21

The graph below displays the pattern of land insured under the Tripura scheme for the years. It is clear that, with the exception of 2018, the insured land under the plan for the Rabi crop has gradually increased. Contrarily, the pattern for the Kharif crop is completely different, as insured land increases up until 2017 before falling precipitously after that. The following year, which ranks as the highest of all, sees it rise once more.

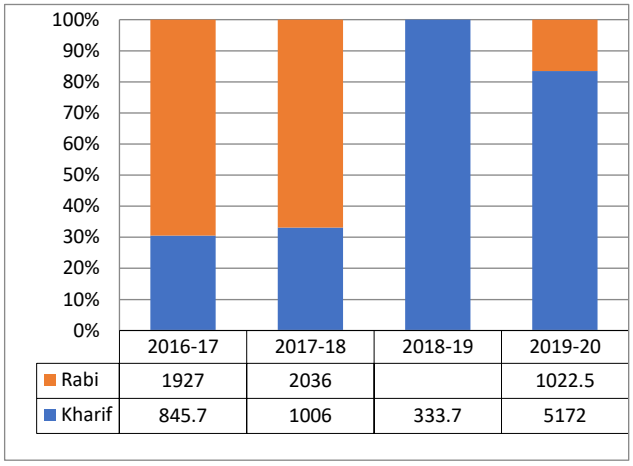

Fig 1 Year wise area of land insured (Ha)
Source: Computed from Economic review of Tripura, 2020-21

The claim settlement progress for Tripura's farmers under the programme is shown in the graph below. It is clear that the scheme distributed 70.54 lakh in 2016 for claim settlement. Within a year, it increased to 99.63 lakh. But the number fell significantly in the next year, to 1.52 lakh. 77.63 lakh cash was finally distributed for claim settlement in 2019.

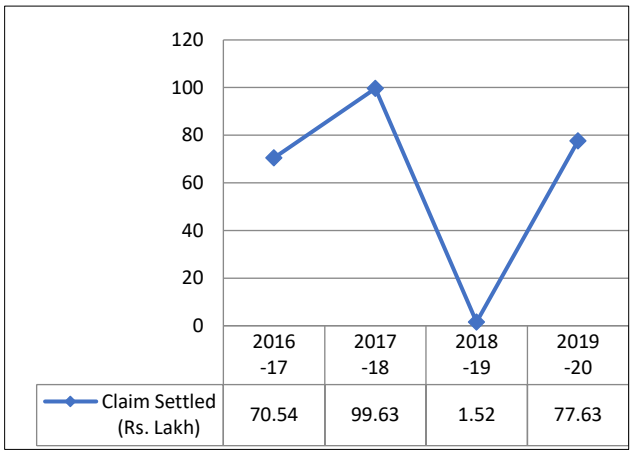

Fig 2 Trend of Claimed settle during 2016-2019
Source: Computed from Economic review of Tripura, 2020-21

Sample characteristics

Improvement in socio-economic condition remains one of the vital issues in the contemporary world, particularly in developing countries. The table shows the preponderance of males working as farmers, and we find that only 7 per cent of the respondents are female. The table also provides information about the education level of the respondents. It is noted that most of the farmers have attained primary education while only 2 per cent have education above higher secondary level. It is notable that around 22 per cent of the farmers have attained secondary level of education.

The table also shows that the majority of farmers are between the ages of 45 and 54 years (39 per cent) followed by 35 to 44 years (28 per cent), respectively. Furthermore, it should be mentioned that 26 per cent of farmers are above the age of 55 years. It is interesting to note that the young generation participates very little in farming, showing that it does not appeal to them. In addition, 38 per cent of farmers have family size of five or more, compared to 62 per cent of farmers who have families of three to four members.

Table 2 Basic statistics of sample farmers

Gender	Percentage (per cent)
Male	93
Female	7
Age	
18-24	2
25-34	5
35-44	28
45-54	39
55 and above	26
Education level	
Illiterate	19
Primary	50
Secondary	22
Higher Secondary	7
Above higher secondary	2
Family size	
3 to 4	62
5 and above	38

The (Table 2) describes the agricultural and farming features in the research area. As can be seen from the table, 67 per cent of respondents stated that their primary occupation is agriculture. The table makes it clear that practically every farmer falls under the category of marginal farmer because their land size is less than one hectare. This outcome is consistent with the tenth agricultural census as well. Farmers' income is considerably lower as a result of their small plots of land. The majority of farmers (72 per cent) make less than 1 lakh, as it can be observed from the table, while only 8 per cent of farmers have incomes of more than 2 lakh. The table also shows that a considerable proportion of farmers (28 per cent) had experience ranging from 11 to 15 years, followed by 16 to 20 years (23 per cent) and 6 to 10 years (21 per cent). The majority of farmers (53 per cent) indicated that rice was their main crop. Furthermore, 33 per cent of respondents report fruit as their main crop, followed by jute (13 per cent).

(Table 3) shows the general level of PMFBY scheme awareness among respondents. The surprising statistic is that 76 per cent of farmers are not PMFBY registrants and have never heard of the programme. Regarding coverage period, 66 per cent of respondents desired coverage from sowing to harvest, while 34 per cent said they would prefer the coverage period from pre-sowing to post-harvest. A key finding is that although farmers may be aware of crop insurance, they do not always know the exact name of the programme. Do you have crop insurance through PMFBY? Was the query posed to the responders? This might have influenced their response in this case, “No”.

Table 3 Farm and farming features

Agriculture as primary occupation	Percentage
Yes	67
No	33
Farm size	
0.08 hectare – 0.16 hectare	57
0.17-0.32 hectare	29
0.33-0.64 hectare	14
Farm income	
Below 1 lakh	43
1.1 lakh - 1.5lakh	36
1.6lakh - 2 lakh	13
Above 2 lakh	8
Non-farm income	
Below 1 lakh	72
1 lakh - 1.5 lakh	20
1.5 lakh - 2 lakh	3
Above 2 lakh	5
Year spent on farming	
Below five years	12
6 – 10 years	21
11 – 15 years	28
16 - 20 years	23
21 and above	16
Primary crop	
Rice	53
Vegetables	1
Fruits	33
Jute	13

Table 4 Crop insurance status and coverage

Crop insurance	Percentage (per cent)
Yes	24
No	76
Coverage period	
Pre-sowing to post-harvest	34
Sowing to harvest	66

According to (Table 4), the farmers' lack of need for crop insurance (28 per cent) and their dread of the application process for insurance (21 per cent) are the two most significant reasons for not having any insurance. Additionally, 17 per cent of the farmers expressed the opinion that the complex documentation required by the scheme caused them to refrain from it. Interestingly, only 13 per cent of respondents claimed to be uninformed of the scheme and that their inability to pay the premium precluded them from acquiring crop insurance. However, 8 per cent of farmers mention the bank's unwillingness to work with them as a factor in not having crop insurance.

Table 5 Reason for not insuring the crop

Attributes	Percentage
Bank's lack of cooperation	8
Fear of the involved process	21
Intricate documentation	17
Lack of ability to pay the premium	13
I have not felt the need	28
Unaware of the facilities	13

(Table 5) below displays the range of insurance amounts held by the farmers in the sampled area. The table shows that most farmers (52 per cent) had insurance coverage for 20,000 per hectare, then 30,000 per hectare (37 per cent). It is interesting to note that just 11 per cent of farmers have 40,000 per hectare of coverage.

Table 6 Insured sum

Range	Percentage
20,000/hectare	52
30,000/ hectare	37
40,000/ hectare	11

It should be highlighted that climate change is one concern related to agriculture. An increase in greenhouse gas emissions is causing global warming. Due to climate change, agriculture is becoming more and more volatile, and this tragedy has a detrimental influence on the industry nationwide [24]. This is also true for the current study, as 64 per cent of farmers believed they had experienced risk in their region, compared to 36 per cent of respondents who said they had not. Table 6 demonstrates that climate change (64 per cent) is the leading risk factor, followed by crop failure (21 per cent) and changing production costs (15 per cent). In such cases, the study identifies two methods adopted in the sample area for calculating the farmers' losses. Further, it can be seen from table 5 that rainfall-based indexing is the most popular way of loss estimation (83 per cent), whereas 17 per cent of farmers said that evaluation is done through cost-cutting at the Panchayat/village level.

Table 7 Risk experienced in the last 3 years

Attributes	Percentage
Yes	64
No	36
Risk factors	
Climate risk	64
Crop failure	21
Changes in the cost of production	15
Method of loss assessments	
Crop-cutting exercise at village / Panchayat	17
Rainfall based index	83

The perceptions of the farmers' risk management practices are shown in (Table 7) below. Farmers do confront risk, as demonstrated by the prior table, but most of them expressed the opinion that the threats will be reduced as soon as it materialises. Only 37 per cent of farmers indicated that getting insurance would help. Additionally, a minimum percentage of farmers (8 per cent) claimed they do not care about risk, while 9 per cent believed they make savings to reduce potential hazards in the future.

Table 8 Risk management strategies by farmers

Attributes	Percentage
Mitigate risk by taking insurance	37
I never worry about the risk	8
I believe that the risk will be mitigated when it arises	46
I undertake savings & maintain cash reserves to mitigate future risk	9

The perspectives of farmers on the effects on the environment are shown in the following table. The table shows that around 73 per cent of the respondents claimed that rainfall varied in the study area and around 79 per cent experienced change in temperature during the last three years.

Table 9 Perception about impact of the environment (%)

Attributes	Yes	No
Variation in rainfall during last three years	73	27
Change in temperature during last three years	79	21
Modify crop session	60	40

Determinants of crop insurance uptake: Results from regression analyses

Let us begin by looking at the bivariate association of the dependent variable viz., crop insurance demand with various factors assumed to influence it. (Table 10) presents the results of chi-square analyses of independence between the dependent variables and various independent variables. Overall, all the chi square values (χ^2), with the exception of gender, education of spouse, type of primary crop and cropping session skipped are highly significant, indicating that each of the independent variables is related with crop insurance demand. (Table 10) shows that crop insurance demand differs among age-groups and greater proportions of farmers from the older age-groups have taken crop insurance under PMFBY. Crop insurance demand also varies significantly by the educational attainment of farmers and perhaps not surprisingly greater proportions among the more educated have taken crop insurance. Also, number of children has a significant association with crop insurance demand and in fact, larger proportions of farmer with fewer children have taken crop insurance.

With respect to farm characteristics, we find that farm size, farm income, primary occupation and farming tenure are significantly associated with the uptake of crop insurance. It is interesting to note that as compared to farmers with very less or very large amounts of farm land, greater proportion among those with medium farm sizes have taken crop insurance. Significantly greater proportions among farmers with lower yearly farm incomes have taken crop insurance as compared to richer farmers. Also, greater proportion of agriculturists whose primary occupation is farming has revealed greater demand for crop insurance (Table 10). Not surprisingly, farming tenure is significantly associated with crop insurance and a greater proportion among those who have been in the farming profession for more than 15 years have taken crop insurance under the PMFBY. It could be noted here that coverage period wanted has a significant association with crop insurance demand. As compared to those who expressed desire for sowing to harvest only, greater proportion of farmers among those who states that the coverage period wanted was pre-sowing to post-harvest, have taken crop insurance.

Finally, perceptions of climate change captured through variables such as perceptions of overall changes in climate during last three years, perceptions of changes in pattern of rainfall or temperature changes during the previous three years have been found to be associated with uptake of crop insurance. For instance, around 36 per cent of farmers among those who had experienced climate change have taken crop insurance as compared to just 3 per cent among those who did not.

Table 10 Cross tabulations of crop insurance demand by various independent variables (percent)

Variables	Whether taken crop insurance		
	Yes	No	χ^2
Age group			
18-24	0.00	100	
25-34	0.00	100	
35-44	7.1	92.9	10.252**
45-54	35.9	64.1	
55 and above	30.8	69.2	
Gender			
Male	23.7	76.3	0.086
Female	28.6	71.4	
Education of farmer			
Illiterate	5.3	94.7	5.486*
Primary	25.8	74.2	
Secondary and above	36.8	63.2	
Education of spouse			
Illiterate	5.3	94.7	6.271
Primary	25.8	74.2	
Secondary	38.1	61.1	
Higher education	0.00	100.0	
Number of living children			
2 or less	28	72	4.094**
3 or more	5.6	94.4	
Farm size (hectare)			
0.08 - 0.16	24.6	75.4	6.178**
0.17 - 0.32	34.5	65.5	
0.33 - 0.64	0.00	100	
Farm income			
Below 1 lakh	30.6	69.4	5.394**
1.1 lakh-1.5 lakh	10.0	90.0	
1.6 lakh- 2 lakh	0.00	100	
Above 2 lakh	0.00	100	
Agriculture is primary occupation			
No	6.1	93.9	8.690***
Yes	32.8	67.2	
Duration in farming profession			
Below 5 years	0.00	100	11.569***
16-20 years	16.3	83.7	
21 years and above	41.0	59.0	
Primary crop			
Rice	28.3	71.7	2.750
Vegetables	24.2	75.8	
Fruits	7.7	92.3	
Jute	0.00	100	
Coverage period wanted			
Pre-sowing to post-harvest	36.4	63.6	4.128**
Sowing to harvest	17.9	82.1	
Experienced risk of climate change during last three years			
Yes	31.5	68.5	13.889***
No	3.7	96.3	
Experienced drastic change in rainfall during last three years			
Yes	31.5	68.5	8.353***
No	3.7	96.3	
Experienced drastic change in temperature during last three year			
Yes	29.1	70.9	5.394**
No	23.0	56.0	
Skipped cropping session due to climate change			
Yes	21.7	78.3	0.448
No	27.5	72.5	

The data depicted in (Tables 11-13) present the results of the binary logistic regression analysis. As mentioned before, we carry out three regressions with different sets of predictors. (Table 11) shows the results from estimating Model 1. As can be seen from the table, experiences of climate change risk and change in precipitation have significant association with uptake of PMFBY. In fact, a farmer who agrees to having experienced some form of climate change during the past three years is nearly 21 times as likely to take crop insurance as compared to a farmer who does not report experiencing such risk. Perceptions of changes in precipitation pattern during the past three years increases the likelihood of uptake of crop insurance by nearly 10 times. However, perceptions of changes in temperature have not been found to be significantly associated with crop insurance uptake (Table 11).

Table 11 Results of estimation of Model 1. Dependent variable: Crop Insurance Uptake

Variables	B	Sig. (p value)	Exp (B)
Farmer experienced any climate change risk during past 3 years (Ref. category: Did not experience Risk)	3.049	.020	21.104**
Farmer experienced temperature change during past 3 years (Ref category: Did not experience temperature change)	-1.483	.377	.227
Farmer experienced rainfall change during past 3 years (Ref. category: Did not experience rainfall change)	2.353	.094	10.515*

***Significant at below 1% level;
**Significant at below 5% level,
*Significant below 10% level

The (Table 12) presents the results of estimating Model 2. The independent variables in this model are demographic and socioeconomic characteristics of the farmers (age, educational attainment, annual farm income, and number of living children), farm and farming characteristics (tenure as a farmer, primary occupation) and coverage period wanted. Age does not seem to have any significant association with crop insurance uptake. It is interesting to note that the direction of association between educational attainment and crop insurance is unexpected and those farmers who have higher levels of education are *less* likely to take crop insurance under PMFBY as compared to farmers who have less than primary education. Although several studies have found that higher educational attainment of farmers leads to higher uptake of crop insurance, it has been observed that it is financial literacy that may be more important in this case [2], [11]). Also, some studies found no link between education and crop insurance demand [34].

As can be seen from (Table 12), number of living children and annual farm income are positively associated with uptake of crop insurance. Farmers who have more than two living children are nearly 10 times more likely to take crop insurance as compared to those with two or less children. Also, wealthy farmers have been found to have a higher likelihood of taking crop insurance, and farmers with annual farm incomes more than 1.5 lakhs are 11 times more likely to take crop insurance as compared to those with lower annual incomes as found in several other studies as well [4].

After controlling for other variables, farming tenure does not turn out to be significant. And, those farmers whose primary occupation (main source of income) is farming have been found to be less likely to take crop insurance. Though at first, this finding may appear counterintuitive, it could be explained by the fact that majority of the farmers whose primary occupation is farming in the sample have small farm sizes (not shown in table) and the perceived losses from crop failure might be considered smaller as compared to the 'hassles' of insurance. In fact, larger farm size has been reported to be associated with greater likelihood of crop insurance in previous studies [1]. Finally, farmers who report pre-sowing to post-harvest as the desired coverage period are more than three times as likely to take crop insurance as compared to farmers who report sowing to harvest as desired coverage period.

Table 12 Results of Estimation of Model 2. Dependent variable: Crop Insurance Uptake

Variables	B	Sig. (p value)	Exp (B)
Age (Ref. category: 18-24 years)			
25-34	12.945	1.000	0.211
35-44	-2.631	1.000	0.072
45-54	-6.128	1.000	0.002
55 and above	-5.806	1.000	0.003
Educational Attainment (Ref. category: Illiterate)			
Primary and below	-2.101	.084	0.122*
Secondary and above	-4.962	.004	0.007***
Number of living children more than 2 (Ref. category: 2 or less children)	2.306	.054	10.036*
Annual farm income above 1.5 lakh (Ref. category: Below 1.5 lakhs)	2.490	.096	11.592*
Tenure as Farmer (Ref. category: below 5 years)			
16-20 years	-17.137	.999	.000
21 years and above	-17.552	.999	.000
Agriculture as primary occupation (Ref. category: Agriculture is not primary occupation)	-2.072	.030	0.126**
Coverage period wanted: Pre-Sowing to Post- Harvest (Ref. category: Sowing to Harvest)	1.156	.100	3.177*

***Significant at below 1% level;
**Significant at below 5% level,
*Significant below 10 % level

The (Table 13) presents the results of estimation of Model 3. In the final model with all the independent variables considered together, we find that experience of climate change risk has one of the most robust associations with the uptake of PMFBY and a farmer who agrees to having experienced some form of climate change during the past three years is nearly 11 times as likely to take crop insurance as compared to a farmer who does not report experiencing such risk. As found in Model 2, even here we find that higher educational attainment and agriculture as primary occupation lowers the likelihood of crop insurance uptake. The remaining variables turn out to be insignificant.

Table 13 Results of Estimation of Model 3. Dependent variable: Crop Insurance Uptake

Variables	B	Sig. (p value)	Exp (B)
Age (Ref. category: 18-24 years)			
25-34	8.879	1.000	.241
35-44	-5.522	1.000	.004
45-54	-10.251	1.000	.000
55 and above	-9.597	1.000	.000
Educational attainment (Ref. category: Illiterate)			
Primary and below	-2.021	.107	.132
Secondary and above	-5.380	.004	.005***
Number of living children (Ref. category: 2 or less children)	2.071	.155	7.934
Annual farm income above 1.5 lakh (Ref. category: Below 1.5 lakhs)	1.663	.254	5.276
Tenure as farmer (Ref. category: below 5 years)			
16-20 years	-14.082	.999	.000
21 years and above	-14.277	.999	.000
Agriculture as primary occupation (Ref. category: Agriculture is not primary occupation)	-2.011	.054	.134*
Coverage period wanted: Pre-Sowing to Post- Harvest (Ref. category: Sowing to Harvest)	1.412	.100	4.102*
Farmer experienced climate any change risk during past 3 years (Ref. category: Did not experience Risk)	2.427	.092	11.321*
Farmer experienced temperature change during past 3 years (Ref. category: Did not experience temperature change)	4.243	.345	69.615
Farmer experienced rainfall change during past 3 years (Ref. category: Did not experience rainfall change)	-1.799	.690	.165

***Significant at below 1% level,
**Significant at below 5% level,
*Significant below 10% level

CONCLUSION

Lack of awareness among farmers seems to be a major weakness of the PMFBY. Indeed, this has been reported by several other studies conducted in various parts of India. In this study, we found that only 24 per cent of the farmers are aware of crop insurance. As research has shown there exists a dire need for spreading awareness through outreach progammes and the same has been brought out by the present study. Indeed, the main reasons for not taking crop insurance turned out to be farmers' perception of not needing any insurance and a fear of undertaking the procedure of getting insurance. Further education and awareness of crop insurance will be the tools that will be useful in increasing their willingness to take up crop insurance. In this regard, greater use of digital media could help spread awareness of these schemes among farmers. It could be noted that crop insurance is unquestionably being considered as a tactic to reduce the negative consequences of climate change by farmers as also indicated by previous studies. However, it is possible that it could have unwanted effects such as non-adoption of sustainable agricultural practices. In other words, the problem of moral hazard could arise in this case and the importance of sustainable agricultural practices has to be disseminated among the farmers. As this study brings out the demand for crop insurance is likely to increase through consolidation of holdings as large farm size has been found to have a positive association with crop insurance.

LITERATURE CITED

1. Abebe TH, Bogale A. 2014. Willingness to pay for rainfall-based insurance by smallholder farmers in Central Rift Valley of Ethiopia: The case of Dugda and Mieso Woredas. *Asia Pacific Journal of Energy and Environment* 1(2): 121-155.
2. Aditya KS, Khan T, Kishore A. 2018. Adoption of crop insurance and impact: insights from India. *Agricultural Economics Research Review* 31(2): 163-174.
3. Akter S, Krupnik TJ, Rossi F, Khanam F. 2016. The influence of gender and product design on farmers' preferences for weather-indexed crop insurance. *Global Environmental Change* 38: 217-229.
4. Bharati RC, Azad NK, Singh KM, Chakraborti S, Chandra N, Singh SP. 2014. Factors affecting adoption of crop insurance in Bihar. *Journal of Agri Search* 1(2).
5. Bhatnagar A. 2018. Perception of farmers towards agriculture insurance schemes. *Pacific Business Review International* 10(10): 53-56.
6. Çokluk Ö. 2010. Logistic Regression: Concept and application. *Educational Sciences: Theory and Practice* 10(3): 1397-1407.
7. Directorate of Economics and Statistics Planning (Statistics) Department, 2018-2019: Economic Review, Government of Tripura, Agartala, Tripura, 20th issue: 1-383.
8. Duhan A, Singh S. 2017. Factors affecting awareness level of farmers about crop insurance: A case study of Haryana. *Asian Journal of Agricultural Extension, Economics and Sociology* 1-7.
9. Gautam, Yograj A, Andersen P. 2016. Rural livelihood diversification and household well- being: Insights from Humla, Nepal, *Journal of Rural Studies* 44: 239-249.

10. Ghosh RK, Gupta S, Singh V, Ward PS. 2020. Demand for crop insurance in developing countries: New evidence from India. *Journal of Agricultural Economics* 72(1): 293-320.
11. Hassanpour B, Asadi E, Parhizkar S. 2013. Factors influencing crop insurance demand in KB province, Iran: Logit Model Approach. *International Journal of Agriculture and Crop Sciences* 5(18): 2028.
12. https://news.ncsu.edu/2021/08/crop-insurance-unintended-consequences/
13. ICAR. 2014: Livelihood improvement and empowerment of rural poor through sustainable farming systems in North-East India, Research Complex for NEH Region, Umroi Road, Umiam-793103, Meghalaya, India. pp 1-168.
14. Kulikowski M. 2021 Crop insurance and unintended consequences. Science Daily, North Carolina State University. Retrieved from https://www.sciencedaily.com/releases/2021/08/210813152036.htm
15. Kumar DS, Barah BC, Ranganathan CR, Venkatram R, Gurunathan S, Thirumoorthy S. 2011. An analysis of farmers' perception and awareness towards crop insurance as a tool for risk management in Tamil Nadu. *Agricultural Economics Research Review* 24(1): 37-46.
16. Mishra PK. 1995. Is rainfall insurance a new idea? Pioneering Work Revisited. *Economic and Political Weekly* 30(25): 84-88.
17. Mittal S, Tripathi G, Sethi D. 2008. Development strategy for the hill districts of Uttarakhand, Indian Council for Research on International Economic Relations, Working paper No. 217: 1-95.
18. Nelson GC, Rosegrant MW, Koo J, Robertson R, Sulser T, Zhu T, Lee D. 2009. Climate change: Impact on agriculture and costs of adaptation (Vol. 21). Intl. Food Policy Res Inst. *Political Weekly* 30(25): 84-88.
19. Prasad Sati V 2015. Changes in farming systems and livelihood patterns in mountainous region of Mizoram, Eastern Extension of the Himalaya. *Indian Journal of Hill Farming* 28(2): 111-120.
20. Raju SS, Chand R. 2007. Progress and problems in agricultural insurance in India, *Economic and Political Weekly* 42(21): 1905-1908.
21. Roy B, Mondal B. 2018. Performance evaluation of Pradhan Mantri Fasal Bima Yojana (PMFBY) in West Bengal. DOI:10.13140/RG.2.2.16911.41120
22. Saraswathi K, Devaraju M. 2018. Awareness and perceptions of farmers about crop insurance: A study in Kolar district of Karnataka State. *International Journal of Advances in Science Engineering and Technology* 6(1): 90-94.
23. Soni BK, Trivedi J. 2013. Crop insurance: An empirical study on awareness and perceptions. *Gian Jothi E. Journal* 3(2): 1-13.
24. Subhankar M, Parthapratim P. 2017. Impediments to the spread of crop insurance in India. *Economic and Political Weekly* 52(35): 16-19.
25. Wąs A, Kobus P. 2018. Factors differentiating the level of crop insurance at Polish farms. *Agricultural Finance Review* 78(2): 209-222.