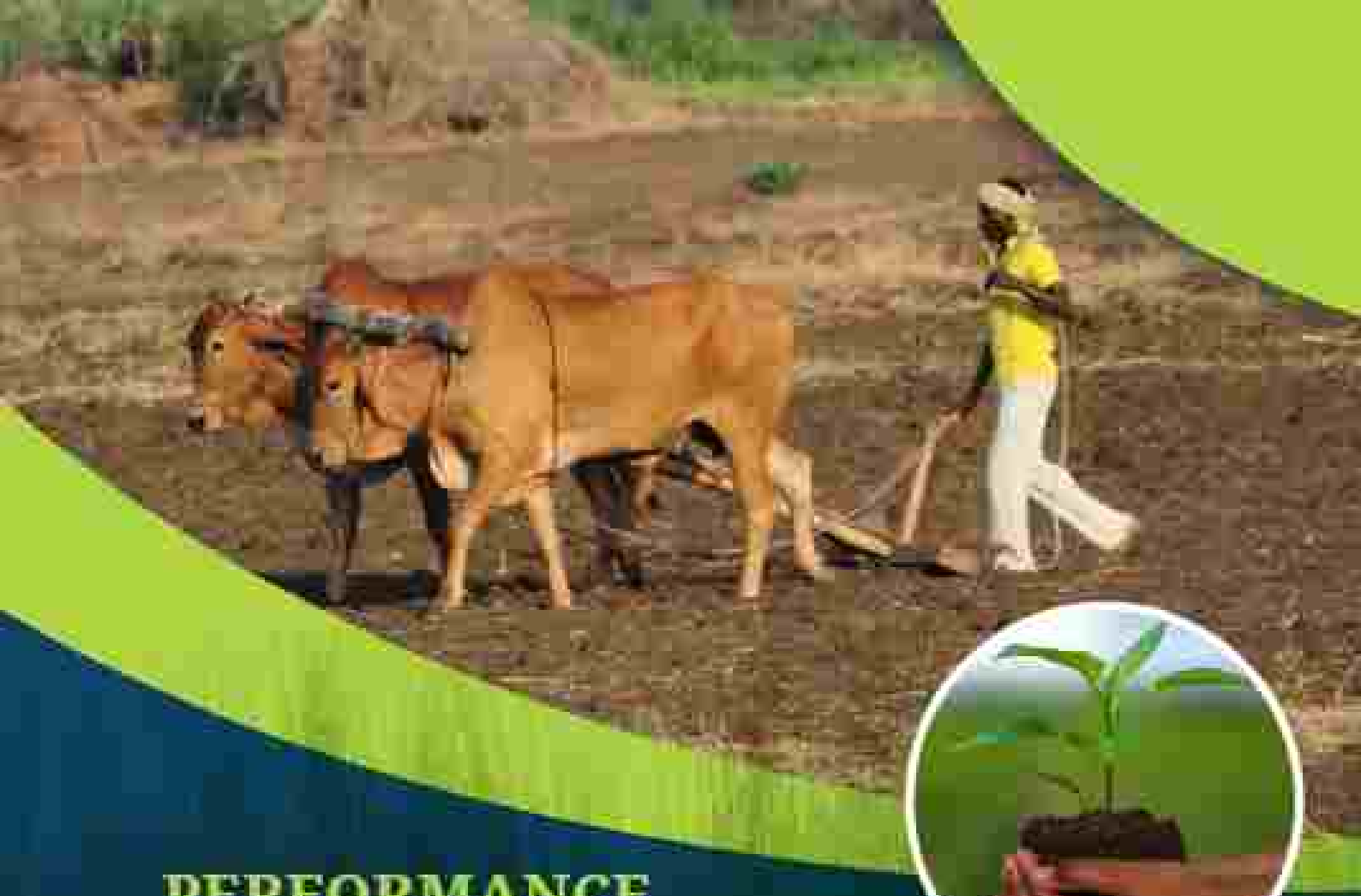

PERFORMANCE EVALUATION OF PRADHAN MANTRI FASAL BIMA YOJANA (PMFBY)

PART II

"Uptake and Willingness-To-Pay"

Project Coordinator
Ranjan Kumar Ghosh

Center for Management in Agriculture (CMA)
Indian Institute of Management Ahmedabad (IIMA)
Vastrapur, Ahmedabad – 380015

Supported by
Ministry of Agriculture and Farmers Welfare, Government of India

FEBRUARY 2019

FINAL REPORT

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Contents

-	Executive Summary	ix
Chapter 1	Introduction	1
Chapter 2	Socio-Economic and Farm-Level Characteristics	5
Chapter 3	Insurance Behavior	29
Chapter 4	Willingness-To-Pay	41
Chapter 5	Summary and Policy Insights	53
-	References	59

List of Tables

Table	List of Tables	Page
Chapter 2: Socio-Economic and Farm Level Characteristics		**5**
Table 2.1a:	Selected states	5
Table 2.1b:	State-wise list of sampled districts based on uptake	6
Table 2.2:	Farmer categories	6
Table 2.3:	Family demography	7
Table 2.4:	Socio-economic profile of farmers -	8
Table 2.5:	Caste distribution	9
Table 2.6:	Agriculture as primary or secondary occupation	10
Table 2.7:	Sources of non-agriculture income	12
Table 2.8:	Sources of credit	14
Table 2.9a:	Purpose of credit	15
Table 2.9b:	Average quantum of credit	16
Table 2.10:	State wise average irrigated and un-irrigated land details	18
Table 2.11:	Cropping pattern: State wise percentages of the major crop distribution	19
Table 2.12:	State wise cropping intensity and per household net operated area	20
Table 2.13:	Overall coverage of the crop insurance for the Rabi and Kharif season	21
Table 2.14:	State wise production per farm during Kharif season	24
Chapter 3: Insurance Uptake		**28**
Table 3.1:	Awareness of PMFBY	29
Table 3.2:	Availed any crop insurance scheme earlier	31
Table 3.3:	Insured under PMFBY	33
Table 3.4:	Medium of information	35
Table 3.5:	Satisfaction level	36
Table 3.6:	Overall experiences	39
Chapter 4: Willingness-To-Pay		**41**
Table 4.1:	Attributes and attribute levels included in discrete choice experiment	46
Table 4.2:	Descriptive statistics of sample households	48
Table 4.3:	Utility function estimates from discrete choice experiment	50

List of Figures

Figure	List of Figures	Page
Chapter 4: Willingness-To-Pay		**41**
Figure 4.1	Example choice set	47

Executive Summary

This report presents results from a primary survey conducted with a sample of farmers in nine Indian states that were covered under the Pradhan Mantri Fasal Bima Yojana (PMFBY) in the year 2017-18. These results give insights on various features of the sampled insured farmers such as their socio-economic characteristics, the farm-level features, their response and attitude towards insurance and also their willingness-to-pay for crop insurance. A stratified random sample of 1362 farmers was drawn from over 27 districts of 9 states - Assam, Bihar, Gujarat, Himachal Pradesh, Maharashtra, West Bengal, Karnataka and Madhya Pradesh. Nearly 80% of the sampled farmers were enrolled/insured under PMFBY at least once during 2015-17. The mean agricultural income was Rs. 1, 36,187 whereas the mean non-agricultural income was Rs. 1,21,564. The mean net operated irrigated area was 3.54 acres and unirrigated was 2.53 acres. The highest mean agricultural incomes of insured farmers were in the states of Himachal Pradesh, Madhya Pradesh and Gujarat. Non-agricultural income was higher than agricultural income, on an average, in the states of Madhya Pradesh, Karnataka, West Bengal, Maharashtra and Gujarat.

Average outstanding loans were highest in the states of Karnataka, Maharashtra and Himachal Pradesh. In Bihar, we could not get farmers to provide data with clarity. Net operated irrigated area per farmer is highest in the states of Madhya Pradesh and Gujarat. In the states of Assam and Himachal Pradesh, unirrigated area is higher on average than irrigated. Every surveyed farmer was also asked about their perceptions about crop insurance and experiences with PMFBY. In Assam, Himachal Pradesh and Uttar Pradesh, over 95% of the loanee insured farmers had heard of PMFBY whereas in West Bengal and Gujarat, less than 79% of farmers were aware of PMFBY. In Karnataka, while none of the non-loanee farmers had availed of the previous insurance schemes like NAIS, nearly 72 percent of the loanee farmers had availed crop insurance at some point in the past. Among non-insured control group farmers in Karnataka, all had availed of the previous NAIS scheme. On the other hand, in Gujarat, among the loanee farmers, 70 percent had availed of previous schemes, and among the non-loanee farmers, 100

percent had availed previous schemes. In Madhya Pradesh, respondents suggested that there should be higher as well as timely compensation in order to improve the scheme, while a few others suggested that the premiums should be lower. In West Bengal, the respondents surveyed suggested that the awareness must be increased among the farmers and that the panchayat should play a leading role. In Gujarat, while all the loanee farmers informed the concerned insurance companies about their individual losses, all the non-loanee farmers informed about the loss to the government. While 33 percent of the loanee and 72 percent of the non-loanee farmers in Madhya Pradesh reported their losses to the government, 47 percent of the loanee and 27 percent of the non-loanee farmers reported their losses to the concerned banks.

The Willingness-to-Pay (WTP) study focused on the assessment of the demand for agriculture insurance using Discrete Choice Experiments (DCE's), a form of stated choice analysis in which preferences are sought from participants based on responses to hypothetical scenarios rather than observed choices in actual market settings. It allows studying preferences for specific characteristics or attributes of an insurance product – in an experimental setting – by controlling product attributes. The specific attributes for which farmer's preferences were analyzed included insurance coverage period, the method of loss assessment, the delivery of insurance payments, the sum insured, and the cost of insurance. For example, under PMFBY, insurance covers the entire period from pre-sowing until after harvest. Other alternatives could include only the period from sowing until harvest, or merely pre-sowing or post-harvest. Choice sets were translated in local languages (Hindi for Uttar Pradesh and Himachal Pradesh, Kannada for Karnataka and Gujarati for Gujarat) to ensure respondents could read and interpret the choice sets with aid from the enumerators.

Results from analysing farmers' selections of the choice sets indicate that they value full coverage very highly. Farmers would require significant discounts for policies covering only the pre-sowing and only the post-harvest periods. Additionally, farmers would require a smaller discount for policies covering only the period from sowing to harvest, so it seems clear that farmers perceive some risks of crop loss due to sources apart from just rainfall (which presumably would be covered by a sowing to harvest policy). Farmers would require discounts for policies in which the method of assessment was either remote sensing or rainfall indices. In principle, giving such discounts would be more cost-effective than going for the very costly manual CCEs. Farmers are willing-to-pay a significantly higher premium for insurance if they believe that payments would be timely (i.e., guaranteed within six weeks of loss assessment). With other potential methods of loss assessment available that could speed up the turnaround time, it may be possible for insurance providers to guarantee more timely insurance payments. This way, they will gain a greater market and make up for the loss due to offering discounts. Overall, farmers are willing-to-pay significantly higher premiums. On an average, farmers would be willing to pay nearly a 10 percent premium for a policy similar to PMFBY, much higher than the present rates, indicating a generally high acceptance for crop insurance products.

Chapter 1

Introduction

1.1. PMFBY: Overview

Pradhan Mantri Fasal Bima Yojana (PMFBY) is one of the world's largest crop insurance programs aimed at providing risk cover to Indian farmers from production vulnerabilities. It was launched in early 2016 with the key feature being a highly subsidized and affordable premium for farmers. Under PMFBY, farmers pay a very low premium of maximum 2% during Kharif sowing, 1.5% during Rabi sowing for food and oilseed crops; whereas for annual commercial crops they have to pay a maximum of 5%. The difference between actuarial premium rates and the farmer rates is shared equally between the Central and the State governments. PMFBY has replaced the previously existing schemes of National Agricultural Insurance Scheme (NAIS) as well as the modified NAIS. All farmers that avail of seasonal crop loans (loanee farmers) are by default expected to be included in the PMFBY scheme whereas other farmers can purchase the insurance voluntarily at similar net premium burden. Different types of important risks such as yield losses due to climatic factors, damages from pests and post-harvest losses, among others are covered under this scheme. The scheme is implemented on an 'area approach' where insured unit is usually the village panchayat level for major crops.

As of the latest available figures, close to 5 crore farmers were enrolled in the year 2017-18 for both the Kharif and Rabi seasons. This is a jump of nearly 40% from the year 2015 when earlier insurance schemes were present. It has been projected that these numbers will significantly increase with every season as farmers across the world have shown to have a strong aversion to production related risks. The promise of this increased coverage will depend on the successful implementation of the program that can be judged by some important parameters such as increase in voluntary take-up by non-loanee farmers, claims to premium ratio, and a viable business model for insurance agencies. The attractiveness of the scheme for the two important stakeholders, farmers

and insurance providers. however, depends on accuracy of yield assessment and timeliness of delivery as only these can ensure equity and efficiency. This hinges on the governance structure of the scheme's implementation – the bureaucratic apparatus and the level of stakeholder engagement.

In this context, we select 9 states of Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh and West Bengal to achieve the three following objectives:

Assess the status of PMFBY implementation for both Kharif and Rabi seasons in the years 2017-18 and 2016-17, beginning from the processes of crop notification, insurance company empanelment, premium calculation, yield assessment to claims disbursement.

Study the characteristics of sampled farming households that are beneficiaries of PMFBY, both loanee and non-loanee and to assess the factors that can lead to better uptake of crop insurance.

To find the Willingness-to-Pay (WTP) for crop insurance under Indian conditions through controlled choice experiments with a randomized sample of households.

1.2. Study Design

For Objective 1 – *Governance Analysis* – the process of implementation at the state level was comprehensively mapped with the assistance of nine states Agro-Economic Research Centers (AERCs) involved in the project. The study involved mixed methods of data collection and involved the use of secondary data, as well as collection of primary stakeholder interviews. The tools included directed and open-ended questions to relevant state authority, insurance company or nodal agencies. AERCs approached state level nodal agencies/authorities responsible for PMFBY. These include the State Department of Agriculture, State Statistics Department, State Level Coordination Committee on Crop Insurance (SLCCCI), District Level Technical Committee (DLTC) or any other relevant body. The objective was to gather information on the functions of the contacted agencies, details of banks and insurance companies involved in the concerned districts and district-wise progress report of the PMFBY for Kharif 2016 and Rabi 2017 in the particular state. For the year 2017-18, available state level data was used.

For Objective 2 – *Uptake Analysis* – the process involved understanding what factors promote or dissuade farmers from enrolling under PMFBY, what are the other risk management strategies that farmers have and what are the reasons behind farmers opting for each of them. The study relied on a primary survey questionnaire. A total of 1,350 farmers across all the nine states were surveyed based on random sampling. AERCs sampled roughly 150 farmers across three districts of each state. These three districts were categorized based on the number of farmers and area insured, and each category and each district had a sample size of 50 farmers. No district with zero loanee

farmers were selected. A low uptake district was that which had lowest number of loanee and non-loanee farmers; a medium uptake district was the one with median number of farmers whereas a high uptake district had the highest number of farmers enrolled. Best attempts were made to sample on an average 30 loanee, 10 non-loanee and 10 uninsured farmers (control group) from each district.

For Objective 3 – *Willingness-to-Pay (WTP)* – the behavior of farmers with respect to awareness and uptake of crop insurance was investigated, and a detailed experiment on their choice preferences of various insurance policies was conducted. The experiments were performed in collaboration with International Food Policy Research Institute (IFPRI) in the four states of Gujarat, Himachal Pradesh, Karnataka and Uttar Pradesh, through enumerators of AESCs using Computer Assisted Personal Interviewing (CAPI) tool. This involved use of electronic tablets in the process of data collection where surveys and experiments being conducted could be tracked in real-time at a centralized server base. A training workshop was conducted at Indian Agricultural Research Institute (IARI) – New Delhi with the objective of enabling the enumerators collect precise data in the prescribed manner for choice experiments. The choice experiments were conducted with a total of 575 individual farmers in a controlled 'lab-in-the-field' setting to collect the necessary data.

The present report discusses the data and result from Objective 2 and 3 of the study – Uptake and Willingness-to-Pay.

Chapter 2

Socio-Economic and Farm-Level Characteristics

Introduction

This chapter describes the socio-economic background of the farmers surveyed in the various states. Socio-economic profile indicates information on the average age, years of schooling, caste, gender, occupation, family size and income of the various categories of the farmers.

2.1. Socio-economic characteristics of sampled households

Table 2.1a: Selected states

State	Districts	Taluka/Tehsil	Village	Farmers per state
Assam	3	16	45	150
Bihar	3	3	9	155
Gujarat	3	4	22	150
Himachal Pradesh	3	3	56	150
Karnataka	3	14	41	150
Madhya Pradesh	3	5	49	150
Maharashtra	3	6	32	157
Uttar Pradesh	3	16	43	150
West Bengal	3	3	7	150
Total	27	70	501	1,362

Source: Own compilation

Table 2.1a provides the information related to survey conducted in the villages of the different states. The coverage of survey at village level was highest in the state of Madhya Pradesh, Assam, Uttar Pradesh and Karnataka.

Table 2.1b: State-wise list of sampled districts based on uptake

State	Districts		
	High Uptake	Medium Uptake	Low Uptake
Assam	Dhubri	Goalpara	Kamrup Metro
Bihar	Samastipur	Jamui	Saharsa
Gujarat	Rajkot	Sabarkantha	Vadodra
Himachal Pradesh	Hamirpur	Solan	Shimla
Karnataka	Bidar	Kalaburgi	Hassan
Madhya Pradesh	Sagar	Jabalpur	Umaria
Maharashtra	Jalna	Amravati	Pune
Uttar Pradesh	Jhansi	Hardoi	Jaunpur
West Bengal	Burdwan	North 24 Pargana	Dakshin Dinajpur

Source: Own compilation

Table 2.1b shows the districts where primary surveys were conducted to analyse the uptake behaviour of insured farmers. These were selected as high, low and medium uptake districts based on the number of farmers enrolled for PMFBY.

Table 2.2: Farmer categories

State/Farmers category	Loanee insured farmers	Non-loanee insured farmers	Non-insured farmers (Control)	Overall sample
Assam	100	10	40	150
Bihar	124	0	31	155
Gujarat	110	10	30	150
Himachal Pradesh	89	31	30	150
Karnataka	90	30	30	150
Madhya Pradesh	90	30	30	150
Maharashtra	51	73	33	157
Uttar Pradesh	90	30	30	150
West Bengal	90	30	30	150
Sample All (N=1362)	834	244	284	1362

Source: Own compilation

The farmers have been classified into three categories i.e. Loanee Insured Farmers, Non- Loanee Insured farmers and Control Group. The details of the farmers related to the categories have been provided in the following table 2.2. The average number of the farmers surveyed from each state is nearly 150 including all the three categories.

Table 2.3: Family demography

States/ Farmers category	Loanee insured farmers			Non-loanee insured farmers			Non-insured farmers (Control)		
	Average Family Size	Average of Minors < 18 Years	Average Senior Citizens > 59 Years	Average Family Size	Average of Minors < 18 Years	Average Senior Citizens > 59 Years	Average Family Size	Average of Minors < 18 Years	Average Senior Citizens > 59 Years
Assam	5	1.4	0.6	5.3	1.5	0.3	5.2	1.2	0.6
Bihar	6.4	3.2	0.1	NA	NA	NA	6.3	3.13	NA
Gujarat	5.6	1.1	1	4.8	0.4	0.7	5.3	1.2	0.8
Himachal Pradesh	5.2	1.2	0.7	5.6	1.2	0.7	5.3	1.3	0.8
Karnataka	6.0	2.3	1.5	6.5	2.3	1.4	6.1	2.1	1.6
Madhya Pradesh	6.1	1.5	0.6	7	3	0.7	7.3	2.5	0.6
Maharashtra	6.4	1.6	1	5.3	1.8	1	6.1	1.3	1
Uttar Pradesh	8.5	2.3	0.9	7.9	2.4	0.7	9.7	3.4	0.8
West Bengal	5.5	1.8	1.1	4.6	1.5	1.1	4.8	1.4	1.1
Average	6	1.8	0.8	6	1.8	0.9	6.2	1.9	0.8

Source: Own compilation

Table 2.3 indicates the family profile of the farmers. The average family size was highest in Uttar Pradesh followed by Maharashtra, and Madhya Pradesh. The lowest average family size is in Himachal Pradesh. The results also indicate the level of dependency in the different states. The average minors' dependents are highest in Bihar followed by Uttar Pradesh, Karnataka which are higher than the average. Though in Maharashtra the average size of the family is above the average, the minor dependency is lower in Maharashtra. Senior citizen dependency is highest in the state of Karnataka followed by west Bengal, Gujarat, Maharashtra and Uttar Pradesh. It is the lowest in Bihar's loanee category. Similar demographic trend is followed in non-loanee insured and control group.

Table 2.4: Socio-economic profile of farmers

State	Loanee insured farmers			Non-loanee insured farmers			Non-insured farmers (Control)		
	Age (Years)	Family members involved in Agriculture	Agriculture Income (in Rs.)	Age (Years)	Family members involved in Agriculture	Agriculture Income (in Rs.)	Age (Years)	Family members involved in Agriculture	Agriculture Income (in Rs.)
Assam	42.9	2.9	58,735	39.6	2.6	31,586	41.8	2.3	41,500
Bihar	46.3	2.1	50,115	NA	NA	NA	42.4	2.2	42,490
Gujarat	55.1	2.9	2,50,975	54.0	3.5	1,20,400	51.3	3.3	2,00,666
Himachal Pradesh	53.8	3	3,44,776	55.8	3.2	4,13,616	49.3	2.7	3,22,916
Karnataka	52.5	1.2	45,350	51.3	1.2	32,266	48.6	1.1	63,533
Madhya Pradesh	47.3	2.5	3,48,593	47.3	3.3	2,84,122	45.8	2.9	1,84,289
Maharashtra	48.9	3.4	1,00,959	48.4	2.6	1,15,357	48.2	3.1	87,343
Uttar Pradesh	54.7	2.4	1,60,449	52.6	2.1	93,222	47.5	3.6	84,478
West Bengal	53	1.7	1,26,586	47.2	1.8	1,24,050	48.6	1.7	72,213
Total	50.5	2.39	1,62,616	49.63	2.56	1,51,940	47.17	2.54	89,576

Source: Own compilation

Table 2.4 shows the socio economic profile of farmers. The average age of surveyed farmers is highest in Gujarat, Uttar Pradesh, Himachal Pradesh and Karnataka respectively. Maharashtra has the largest number of family members engaged in the agriculture occupation followed by Himachal Pradesh. This explains the dependency of people on agriculture as their source of income and livelihood. The average annual income earned by the farmers is lowest in the state of Karnataka, Assam and Bihar. In Bihar the average family size is higher than the average but earn a very low annual income from their occupation. Madhya Pradesh, Himachal Pradesh and Gujarat are earning the highest amount from agriculture.

Table 2.5: Caste distribution

Farmer category	Caste	Assam	Bihar	Gujarat	Himachal Pradesh	Karnataka	Madhya Pradesh	Maharashtra	Uttar Pradesh	West Bengal
Loanee insured	SC	9.33	5.84	4.67	10.00	10.00	2.67	1.91	3.33	12.00
	ST	4.67	0.00	0.67	0.00	3.33	0.00	0.00	0.00	3.33
	OBC	14.67	43.51	5.33	15.33	81.33	34.67	7.01	36.67	23.33
	GEN	38.00	31.17	62.67	34.00	13.33	22.67	22.29	16.67	21.33
	NA	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
Non loanee insured	SC	0.00	0.00	0.00	4.67	2.67	2.00	0.64	2.00	3.33
	ST	0.67	0.00	0.00	0.00	1.33	0.00	0.64	0.00	3.33
	OBC	1.33	0.00	5.33	4.67	11.33	11.33	11.46	14.67	8.67
	GEN	4.67	0.00	1.33	11.33	4.67	6.67	22.46	3.33	4.67
	NA	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.00	0.00
Non-insured (Control)	SC	2.00	2.60	0.00	4.67	0.67	0.67	1.91	0.00	5.33
	ST	2.00	0.00	0.00	0.00	3.33	1.33	0.64	0.67	3.33
	OBC	7.33	16.39	1.33	1.33	9.33	19.33	3.19	13.33	5.33
	GEN	13.33	6.49	18.67	14.00	6.67	4.67	14.65	4.00	6.00
	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00

Source: Own compilation

It is clear from Table 2.5 that majority of the farmers insured are either from the General (GEN) or the Other Backward Class (OBC) than the Scheduled Castes (SC) or Scheduled Tribes (ST). Assam, Gujarat and Himachal Pradesh are the states where farmers from general category have received the benefit of the scheme. Whereas in the state of Bihar, Karnataka, Madhya Pradesh, Uttar Pradesh and West Bengal, OBCs have got the higher benefits from the schemes then other categories. It is also very evident from our results that the coverage of the scheme is very limited in case of STs. This provides a direction to the various agencies to reach out to farmers in these categories and help in making the schemes even more inclusive.

Table 2.6: Agriculture as primary or secondary occupation

States	Loanee insured farmers		Non-loanee insured farmers		Non-loanee insured farmers (Control)		Overall Agri. as Primary Occupation	Overall Agri. as Secondary Occupation
	Agriculture as Primary source	Agriculture as Secondary source	Agriculture as Primary source	Agriculture as Secondary source	Agriculture as Primary source	Agriculture as Secondary source		
Assam	27	23	18	0	28	11	116	34
	(51.9)	(15.9)	(6.7)	(0.0)	(19.0)	(7.3)	(77.3)	(22.7)
Bihar	105	17	8	0	23	7	128	24
	(69.08)	(11.18)	(8.08)	(0.00)	(15.13)	(4.61)	(84.21)	(15.79)
Gujarat	100	2	8	1	28	0	146	3
	(72.48)	(1.34)	(6.04)	(0.67)	(19.46)	(0.00)	(97.99)	(2.01)
Himachal Pradesh	37	48	15	15	12	17	64	72
	(27.21)	(26.41)	(11.03)	(11.03)	(8.82)	(12.50)	(47.06)	52.94
Karnataka	90	0	30	0	30	0	150	0
	(60)	(0)	(20)	(0)	(20)	(0)	(100)	(0)
Madhya Pradesh	90	3	30	2	26	5	146	10
	(57.69)	(1.92)	(19.23)	(1.28)	(16.67)	(3.21)	(93.59)	(6.41)
Maharashtra	49	0	67	1	30	0	146	1
	(33.33)	(0.00)	(45.58)	(0.68)	(20.41)	(0.00)	(99.32)	(0.68)
Uttar Pradesh	72	19	28	7	22	7	110	33
	(47.08)	(12.50)	(15.09)	(4.64)	(14.57)	(4.64)	(28.15)	(21.05)
West Bengal	85	5	30	0	28	1	144	6
	(56.67)	(3.33)	(20.00)	(0.00)	(19.33)	(0.67)	(96.00)	(4.00)

Source: Own compilation; figures in brackets are percentages

Table 2.6 gives a sense of the proportion of farmers having agriculture as primary and secondary occupation. As per our results it seems that Gujarat has the highest percentage of loanee farmers choosing agriculture as their primary occupation whereas Himachal Pradesh has the highest dependency on agriculture as their secondary occupation. Under non-loanee category Maharashtra has the highest dependency on agriculture as primary occupation. Overall Maharashtra and Gujarat farmers have the highest dependency on agriculture as their primary occupation.

Table 2.7 provides information related to the various other non-agriculture source of the income. We will look at the non-agriculture sources of income for the farmers of loanee category. Farmers in Madhya Pradesh earn maximum average income from milk whereas Gujarat receives it from the livestock. The highest average income for the farm labour is again observed in the state of Madhya Pradesh. The scheme of MGNREGA seems to be providing higher benefit to the farmers of Gujarat and Maharashtra than any other state. Least earnings from MGNREGA are observed in the state of Uttar Pradesh and West Bengal. If we observe the data for pension, Bihar has the highest average income from this source. Uttar Pradesh records the highest non-agriculture income from salaries whereas Himachal Pradesh and Gujarat receive maximum from business. Himachal Pradesh farmers also receive high rent on land and house. This table helps us in understanding which states are specializing in which of the activities other than agriculture.

Table 2.7: Sources of non-agriculture income

States	Farmers Category	Milk Income	Livestock Income	Farm Labor	MGNREGA	Remittances	Pensions	Salaried Income	Business	Rents (Houses/ Land)	Others Income	Total Non-Agriculture Income
Assam	Loanee insured	11,831	5,000	16,125	11,167	NA	1,92,000	1,67,100	87,286	50,000	61,692	6,4,750
	Non loanee insured	5,250	6,133	14,375	NA	NA	NA	NA	25,000	NA	NA	25,000
	Non insured (Control)	7,053	5,000	4,000	NA	NA	NA	2,22,000	70,650	NA	41,350	61,350
Bihar	Loanee insured	NA	NA	22,235	NA	28,000	3,19,600	3,16,000	80,545	NA	NA	87,536
	Non loanee insured	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non insured (Control)	NA	NA	41,000	NA	NA	2,40,000	4,52,000	NA	NA	66,667	NA
Gujarat	Loanee insured	83,039	2,88,500	22,000	29,611	NA	2,40,000	29,375	1,05,333	NA	1,17,500	2,30,851
	Non loanee insured	25,000	NA	NA	NA	NA	NA	NA	NA	NA	25,000	25,000
	Non insured (Control)	83,657	5,000	35,000	28,000	NA	2,50,000	6,00,000	1,20,000	NA	3,00,000	2,94,095
Himachal Pradesh	Loanee insured	32,511	22,095	24,833	14,407	11,000	1,94,838	3,03,581	1,60,000	1,80,000	NA	3,91,853
	Non loanee insured	26,000	12,500	40,000	10,450	NA	1,28,015	5,03,625	1,25,933	1,00,000	NA	4,42,581
	Non insured (Control)	31,022	NA	90,000	13,023	NA	1,85,545	2,80,525	1,07,969	55,000	60,000	3,58,830
Karnataka	Loanee insured	2,000	NA	NA	NA	NA	NA	10,000	2,167	NA	NA	30,291
	Non loanee insured	NA	NA	NA	NA	NA	NA	12,500	NA	NA	NA	26,650
	Non insured (Control)	NA	NA	NA	NA	NA	NA	8,667	NA	NA	NA	20,000

States	Farmers Category	Milk Income	Livestock Income	Farm Labor	MGNREGA	Remittances	Pensions	Salaries Income	Business	Rents (House/ Land)	Others Income	Total Non-Agriculture Income
Madhya Pradesh	Loanee insured	185050	35,000	50400	NA	NA	30,000	6,333	5,250	1,000	1,500	3,77,721
	Non loanee insured	52195	NA	51100	NA	NA	20,000	5,971	4,313	NA	NA	6,334
	Non insured (Control)	36500	NA	72270	NA	NA	10,000	9,137	NA	NA	5,000	5,266
Maharashtra	Loanee insured	21,667	11,000	22,000	23,333	60,000	40,000	1,25,000	86,400	NA	22,143	84,630
	Non loanee insured	45,000	10,333	42,625	20,000	46,625	51,000	60,125	81,250	20,000	35,474	75,548
	Non insured (Control)	20,000	20,000	24,500	8,000	NA	NA	77,500	20,000	NA	40,333	66,364
Uttar Pradesh	Loanee insured	28,073	38,944	22,050	8,725	90,667	1,10,000	4,00,000	92,360	12,000	79,417	86,520
	Non loanee insured	25,560	8,000	19,302	3,400	50,000	NA	1,07,000	NA	NA	30,667	41,282
	Non insured (Control)	NA	NA	22,100	6,025	66,000	NA	1,00,000	36,000	NA	40,000	46,150
West Bengal	Loanee insured	NA	NA	19,983	9,084	NA	2,20,000	2,46,182	46,267	21,667	45,143	80,359
	Non loanee insured	NA	NA	18,050	8,667	12,000	1,00,000	60,000	75,300	NA	22,000	50,902
	Non insured (Control)	NA	NA	23,770	8,567	NA	NA	1,26,000	81,500	NA	26,000	63,100
Sample All	Loanee insured	40,020	50,057	26,163	16,055	47,418	1,67,109	1,08,019	70,702	54,133	54,066	1,57,967
	Non loanee insured	29984	11,492	30,920	11,849	36,208	1,06,478	1,22,870	64,359	60,000	30,285	66,634
	Non insured (Control)	27,256	10,470	39,231	11,603	66,000	1,73,306	2,10,092	73,004	55,000	74,269	1,15,509

Source: Own compilation

Table 2.8: Sources of credit

State	Category	Cooperative banks	Commercial banks	Rural banks	Money lender	Savings group	Other	Total
Assam	Loanee	24	76	NA	NA	NA	NA	100
	Non-loanee	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA
Bihar	Loanee	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	1	NA	NA	NA	NA	NA	1
Gujarat	Loanee	62	47	NA	NA	NA	1	110
	Non-loanee	NA	NA	NA	NA	NA	10	10
	Non-insured (Control)	15	1	NA	NA	NA	14	30
Himachal Pradesh	Loanee	14	75	NA	NA	NA	NA	89
	Non-loanee	3	4	NA	NA	NA	NA	7
	Non-insured (Control)	1	3	NA	NA	NA	NA	4
Karnataka	Loanee	34	42	13	NA	NA	NA	89
	Non-loanee	1	NA	NA	NA	NA	NA	1
	Non-insured (Control)	16	10	4	NA	NA	NA	30
Madhya Pradesh	Loanee	7	21	NA	NA	NA	NA	28
	Non-loanee	NA	6	NA	NA	NA	NA	6
	Non-insured (Control)	1	NA	NA	NA	NA	NA	1
Maharashtra	Loanee	25	5	14	NA	NA	2	44
	Non-loanee	8	NA	6	NA	NA	1	15
	Non-insured (Control)	1	6	NA	NA	NA	NA	7
Uttar Pradesh	Loanee	1	59	22	NA	NA	NA	82
	Non-loanee	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA
West Bengal	Loanee	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA

Source: Own compilation

Table 2.8 reports the various sources of credit available to the farmer. In Assam, Himachal Pradesh, Uttar Pradesh and Gujarat, banks- both cooperative and commercial, have played an important role in providing credit to the farmers in the loanee category. Though there is no sufficient data, we get an indication that Regional Rural Banks also played role in providing credit to these farmers.

Table 2.9a: Purpose of credit

State	Category	Variable farm inputs (1)	Farm equipment (2)	Dairy animals (3)	Consumption (4)	Social obligation (5)	Others (6)	(1) and (2)	(2) and (3)
Assam	Loanee	76	0	0	0	0	0	24	0
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	1	NA	NA	NA	NA	NA	NA	NA
Gujarat	Loanee	61	1	1	0	0	1	26	0
	Non-loanee	NA	NA	NA	NA	NA	10	NA	NA
	Non-insured (Control)	9	NA	NA	NA	NA	14	7	NA
Himachal Pradesh	Loanee	76	5	1	7	0	0	0	0
	Non-loanee	1	NA	1	5	0	0	0	0
	Non-insured (Control)	NA	NA	NA	0	NA	NA	NA	NA
Karnataka	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
Madhya Pradesh	Loanee	24	4	NA	NA	NA	NA	NA	NA
	Non-loanee	9	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	1	NA	NA	NA	NA	NA	NA	NA
Maharashtra	Loanee	43	1	NA	NA	NA	NA	NA	NA
	Non-loanee	13	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	6	NA	NA	NA	NA	NA	NA	NA

State	Category	Variable farm inputs (1)	Farm equipment (2)	Dairy animals (3)	Consumption (4)	Social obligation (5)	Others (6)	(1) and (2)	(1) and (3)
Uttar Pradesh	Loanee	77	5	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
West Bengal	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA

Source: Own compilation

Table 2.8a gives us insights about the purpose for which the credit was taken. From the result it can be said that a popular purpose is to buy either variable farm inputs or farm equipment or both. This suggests that farmers do not have enough income to buy the basic requirements for farming. PMFBY will help in reducing the loss due to uncertainties. This will leave farmers with more disposable income to fulfil their basic need.

Table 2.9b: Average quantum of credit (in Rs.)

State	Category	Variable farm inputs (1)	Farm equipment (2)	Dairy animals (3)	Consumption (4)	Social obligation (5)	Others (6)	(1) and (2)	(1) and (3)
Assam	Loanee	23,350	NA	NA	NA	NA	NA	33,850	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
Bihar	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	4,00,000	NA	NA	NA	NA	NA	NA	NA
Gujarat	Loanee	2,05,357	5,03,000	90,000	NA	NA	45,000	2,66,333	NA
	Non-loanee	NA	NA	NA	NA	NA	68,500	NA	NA
	Non-insured (Control)	1,71,044	NA	NA	NA	NA	58,371	42,857	NA

State	Category	Variable farm inputs (1)	Farm equipment (2)	Dairy animals (3)	Consumption (4)	Special obligation (5)	Others (6)	(1) and (2)	(1) and (3)
Himachal Pradesh	Loanee	1,33,393	1,32,000	1,00,000	69,286	NA	NA	NA	NA
	Non-loanee	2,79,000	NA	1,55,000	10,80,000	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	3,00,000	NA	NA	NA	NA
Karnataka	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
Madhya Pradesh	Loanee	1,43,462	3,11,000	NA	NA	NA	NA	NA	NA
	Non-loanee	1,53,333	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
Maharashtra	Loanee	1,54,422	2,50,000	NA	NA	NA	NA	NA	NA
	Non-loanee	82,923	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	50,283	NA	NA	NA	NA	NA	NA	NA
Uttar Pradesh	Loanee	1,01,342	1,14,000	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA
West Bengal	Loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-loanee	NA	NA	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA	NA	NA

Source: Own Compilation

The average loan amount is very high in some states like Gujarat, Maharashtra, Madhya Pradesh, Himachal Pradesh and Uttar Pradesh for buying variable farm inputs. In the same states the demand for the credit is even higher for buying farm equipment and dairy animals.

2.2. Farm level characteristics of sampled households

The main focus of this section is to look at the land holding and cropping patterns of farmers across the states surveyed.

Table 2.10: State wise average irrigated and un-irrigated land details (in acres)

State	Own Land (Acres)			Leased-In Land (Acres)			Leased-Out Land (Acres)		
	Total	Irrigated	Un-Irrigated	Total	Irrigated	Un-Irrigated	Total	Irrigated	Un-Irrigated
Assam	3	1.5	2.1	0.8	0.8	0.7	0.7	0.4	0.6
Bihar	2.1	1.6	1.4	3.5	2.6	4.1	2.9	3.3	3.7
Gujarat	6.7	6.5	8.8	7	7.9	4	NA	NA	NA
Himachal Pradesh	4.8	2.2	4.4	NA	NA	NA	0.2	NA	0.2
Karnataka	6	4.2	5.3	NA	NA	NA	NA	NA	NA
Madhya Pradesh	7.9	7.5	8.7	8.7	7.4	8	NA	NA	3.6
Maharashtra	4.9	4	8.4	4.7	5	4.6	2.2	1.8	2
Uttar Pradesh	3	2.7	2	0.8	0.8	NA	NA	NA	NA
West Bengal	2.4	2	0.6	8.9	9.9	0.5	2.2	1.6	1.5
Sample All	4.5	3.59	2.91	2.49	3.63	2.62	1.86	1.88	1.97

Source: Own compilation

Table 2.10 focuses on the different categories of land holding among farmers. We have categorized it into three categories for all the farmers:

a. Own land:

b. Leased-in land:

c. Leased-out land

Each of the categories is again subdivided into irrigated or un-irrigated land. It is observed that farmers in Madhya Pradesh have highest land holding in own land holding followed by Gujarat. The value is significantly higher than the overall average. A reverse pattern is observed in the case of leased-in land. Gujarat has the highest average leased-in land and Madhya Pradesh stands at second position. Farmers in Assam and West Bengal have very low level of farm holding in all the three categories. Whereas Bihar has lowest own farm land holding but has near about average in the other two

categories. The farmers in Maharashtra hold land close to the overall average in all the three categories.

Table 2.11: Cropping pattern: State wise percentages of the major crop distribution (in percentages)

State	Paddy	Wheat	Groundnut	Maize	Pulses	Oilseed	Vegetable	Cotton	Others
Assam	67.6	0	0	0	0	7.69	24.2	0	0.51
Bihar	58.33	31.88	0	10.42	1.21	0	3.16	0	0
Gujarat	4.9	22.14	19.05	1.52	5.33	1.9	8.3	33.12	3.52
Himachal Pradesh	0.15	49.06	0	44.6	0.42	0.03	7.52	0	1.22
Karnataka	0.44	0.22	0	0	49.1	8.55	1.44	0	40.23*
Madhya Pradesh	25.02	31.17	0	0.51	36.78	0.2	0.12	2.2	2.91
Maharashtra	0.44	0.16	1.23	0.7	21.85	15.15	5.17	26.72	18.58
Uttar Pradesh	11.8	29.2	18.1	4.2	17.2	2.1	1	6.9	0
West Bengal	67.68	0	0	0	1.11	3.5	10.99	0	16.72
Grand Total	25.65	18.98	4.26	6.88	14.69	4.35	6.83	8.77	5.32

Source: Own compilation

Note: In Others - Millets, Ragi, and sugarcane is included

Table 2.11 focuses on the cropping pattern (i.e. land area under the cultivation) across various states. From our results it is observed that West Bengal, Assam and Bihar have the maximum land under cultivation for Paddy. Land for production of Paddy is lowest in Himachal Pradesh, Maharashtra, Karnataka, and Gujarat. Madhya Pradesh has an average production of paddy which is close to the overall average. The land under cultivation for wheat is highest in the state of Himachal Pradesh followed by Uttar Pradesh, Bihar and Madhya Pradesh. For Maize, the land under cultivation is highest in the state of Himachal Pradesh and followed by Bihar. The difference between the two states is significant in terms of land cultivation for Maize. If we observe the results for pulses, Karnataka has the largest area under cultivation of pulses followed by Madhya Pradesh and Maharashtra. Land under cultivation for cotton is seen in the state of Maharashtra and Gujarat. These insights on the cropping pattern will help to come out with the appropriate policy mechanisms for the betterment of soil health.

Table 2.12: State wise cropping intensity and per household net operated area (in acres)

State	Loanee insured farmers				Non loanee insured farmers				Non insured farmers (Control)			
	Cropping Intensity	Net Operated Area (Acre)			Cropping Intensity	Net Operated Area (Acre)			Cropping Intensity	Net Operated Area (Acre)		
		Irrigated Area	Unirrigated Area	Total Area		Irrigated Area	Unirrigated Area	Total Area		Irrigated Area	Unirrigated Area	Total Area
Assam	148.87	1.09	2.18	2.06	161.24	1.59	1.38	2.83	133.15	1.15	2.12	2.63
Bihar	178.71	1.82	1.88	2.80	NA	NA	NA	NA	173.4	1.64	1.51	2.22
Gujarat	118.75	7.58	3.12	7.07	102.22	7.45	7.0	8.24	126.03	6.88	3.45	6.34
Himachal Pradesh	185.09	1.04	2.49	2.65	103.91	1.04	2.32	3.75	104.15	2.45	1.06	2.10
Karnataka	108.32	NA	NA	6.08	105	NA	NA	4.42	99.38	NA	NA	5.97
Madhya Pradesh	194.44	0.63	3.74	6.04	169.38	7.51	5.74	6.78	196.65	5.34	3.16	4.17
Maharashtra	174.21	NA	NA	3.68	102.89	NA	NA	3.87	112.62	NA	NA	2.25
Uttar Pradesh	188.1	3.39	2.25	3.59	109.82	1.82	1.58	2.09	185.07	2.85	2.25	2.44
West Bengal	188.83	2.35	0.67	2.57	228.91	2.39	0.77	2.61	224.58	1.27	0.5	1.39
Grand Total	164.44	4.06	2.33	4.56	155.05	3.73	3.23	4.33	160.75	2.85	2.12	3.29

Source: Own compilation

Table 2.12 shows that the cropping intensity among the loanee category is highest in Madhya Pradesh and Himachal Pradesh. Karnataka, Gujarat and Assam have the lowest crop intensity among the loanee category of farmers. Bihar, Uttar Pradesh and West Bengal have the crop intensity close to the overall average. West Bengal, Uttar Pradesh and Himachal Pradesh are among the highest cropping intensity for the non-loanee farmer. Gujarat and Maharashtra have the lowest cropping intensity in the same category. The net operated area[1] is further classified as irrigated land and un-irrigated land. In both loanee and non-loanee category, Madhya Pradesh has the highest irrigated land followed by Gujarat. For control group, Madhya Pradesh has highest irrigated land after Gujarat. Assam has the lowest irrigated land in all the three categories. In the case of uncultivated land, Madhya Pradesh and Gujarat have the largest net operated area whereas West Bengal and Bihar have the lowest in loanee category. Similar trend is followed in case of control group. In case of non loanee category, un-irrigated land is very low in West Bengal, Assam and Uttar Pradesh. If we look at the total net operated area then highest net operated area is in Gujarat, Madhya Pradesh and Karnataka for loanee farmers. Similar pattern is also observed in case of non loanee and control group.

Table 2.13: Overall coverage of the crop insurance for the Rabi and Kharif season

State	Farmer category	Kharif Season			Rabi Season		
		Premiums Paid (INR)	Loss (INR)	Compensation (INR)	Premiums Paid (INR)	Loss (INR)	Compensation (INR)
Assam	Loanee insured	NA	NA	NA	1,407.60	NA	NA
	Non-loanee insured	NA	NA	NA	201.6	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Bihar	Loanee insured	943.0	47,132.5	22,643.52	801.60	62,916.67	23,305.02
	Non-loanee insured	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Gujarat	Loanee insured	3,963.72	18,061.88	11,270.25	4,500.00	NA	NA
	Non-loanee insured	4,629.33	21,850.44	15,480.00	3,525.00	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA

[1] We have calculated the net operated area as the sum of own land and leased-in land minus leased-out land and uncultivated land.

State	Farmer category	Kharif Season			Rabi Season		
		Premiums Paid (INR)	Loss (INR)	Compensation (INR)	Premiums Paid (INR)	Loss (INR)	Compensation (INR)
Himachal Pradesh	Loanee insured	162.81	12,119.14	1,348.16	133.37	10,144.68	NA
	Non-loanee insured	192.96	12,030.77	1,430.19	228.14	17,650.00	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Karnataka	Loanee insured	NA	NA	NA	NA	NA	NA
	Non-loanee insured	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Madhya Pradesh	Loanee insured	2,425.78	1,761.11	8,235.83	1,819.30	NA	NA
	Non-loanee insured	2,027.90	1,500.00	6,978.83	1,520.90	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Maharashtra	Loanee insured	1,243.45	35,379.95	NA	1,000.00	2,675.00	NA
	Non-loanee insured	968.27	33,548.48	4921.42	319.09	7,727.27	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
Uttar Pradesh	Loanee insured	572.97	255	406.65	659.26	159.09	97
	Non-loanee insured	763.39	4,000.00	NA	227.73	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA
West Bengal	Loanee insured	NA	NA	NA	NA	NA	NA
	Non-loanee insured	NA	NA	NA	NA	NA	NA
	Non-insured (Control)	NA	NA	NA	NA	NA	NA

Source: Own compilation

Table 2.13 gives insights about the overall coverage of the crop insurance for different seasons. The highest premium for the Kharif season is recorded for the state of Gujarat, Madhya Pradesh and Maharashtra in loanee category. It is lowest in the state of Himachal Pradesh, Uttar Pradesh and Bihar respectively. When we see the results for non-loanee category it follows the same trend. However, the premium for non-loanee category is higher than loanee category in the state of Himachal Pradesh and Uttar Pradesh. For Rabi season the highest premium for the loanee category is recorded in the state of Gujarat followed by Madhya Pradesh, Assam and Maharashtra. There are not much changes in the premium as in the case of loanee farmers of Kharif season. This means that the overall premium is both the season is less in the state of Himachal Pradesh, Uttar Pradesh, and Bihar for loanee farmers. However, the data of Karnataka and West Bengal is not sufficient to draw any conclusions. In case of non-loanee farmers, in Rabi season the premium is lower than premium of Kharif season in all the state except Himachal Pradesh. The highest seasonal loss (for both Kharif and Rabi) is recorded in Bihar for loanee farmers followed by Maharashtra and Gujarat. The absolute seasonal compensation for loanee farmers is higher in Bihar followed Gujarat and Madhya Pradesh for Kharif season. The data for seasonal compensation for Rabi is not sufficient to draw any conclusions.

Table 2.14: State wise production per farm during Kharif season (in Quintals)

State	Farmer category	Paddy		Groundnut		Maize		Pulses		Oilseed		Vegetables		Cotton		Others	
		Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)	Main Product (kg)	By Product (kg)
Assam	Literate farmer	14.59	9.43	NA	NA	NA	NA	NA	NA	NA	NA	22.93	0	NA	NA	2.83	0.64
	Illiterate farmer	35.07	5.04	NA	NA	NA	NA	NA	NA	NA	NA	2.00	0	NA	NA	NA	NA
	Non farmer (Control)	12.16	8.44	NA	NA	NA	NA	NA	NA	NA	NA	15.97	0	NA	NA	1.6	0.38
Bihar	Literate farmer	34.53	38.89	NA	NA	4.50	2.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Illiterate farmer	29.04	31.09	NA	NA	4	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Non farmer (Control)	21.0	12.29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gujarat	Literate farmer	38.88	4	14.19	1.04	30.40	1.26	0.2	0.04	14.44	0	45.97	0	14.01	1.08	16.40	0
	Illiterate farmer	NA	NA	25.20	0	NA	NA	20	0	0.8	0	NA	NA	14.05	0	NA	NA
	Non farmer (Control)	NA	NA	19.32	0	15	24	7.33	0	13.11	0	90	0	23.34	0.12	17.3	0
Himachal Pradesh	Literate farmer	2	1	NA	NA	2.33	0.89	0.25	0	NA	NA	11.21	1.11	NA	NA	1	2
	Illiterate farmer	3	1	NA	NA	3	4.09	NA	NA	NA	NA	7.39	0	NA	NA	NA	NA
	Non farmer (Control)	NA	NA	NA	NA	11.36	5.95	NA	NA	0.03	0	20.35	0	NA	NA	NA	NA

State	Farmer category	Poultry		Ornamental		Maize		Pulses		Oilseed		Vegetables		Cotton		Others	
		Main Product (kg)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)
Karnataka	Low-input farmers	NA	NA	NA	NA	NA	NA	10.91	5	11.85	NA	NA	NA	NA	NA	19.74	107.7
	Mid-input farmers	NA	NA	NA	NA	NA	NA	13.23	13.23	12	NA	NA	NA	NA	NA	9.82	9.82
	High-input farmers (Control)	NA	NA	NA	NA	NA	NA	13.35	13.35	7.5	NA	NA	NA	NA	NA	18.23	18.5
Madhya Pradesh	Low-input farmers	120.2	43.14	NA	NA	2.5	0	26.06	2.62	7.5	0	NA	NA	NA	NA	NA	NA
	Mid-input farmers	100.2	27.75	NA	NA	5.5	0	15.15	2.92	8	0	NA	NA	NA	NA	NA	NA
	High-input farmers (Control)	63.63	52	NA	NA	NA	NA	16.46	3.77	NA	NA	NA	NA	NA	NA	NA	NA
Maharashtra	Low-input farmers	0	0	NA	NA	NA	NA	NA	NA	NA	NA	37.5	0	NA	NA	NA	NA
	Mid-input farmers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140	0	NA	NA	NA	NA
	High-input farmers (Control)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	NA	NA	NA	0	0

State	Farmer category	Poultry		Ruminant		Maize		Pulses		Oilseed		Vegetables		Cotton		Others	
		Main Product (kg)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)	Main Product (qty)	By Product (qty)
Uttar Pradesh	Low-input farmers	24.15	16.24	10.3	0	7.41	0.5	3.08	2.10	NA	NA	NA	NA	NA	NA	3.75	3.75
	Mid-to-high-input farmers	14.97	15.64	9.47	0	6.81	4.5	2.62	1.77	NA	NA	NA	NA	NA	NA	NA	NA
	Non-farmers (Control)	22.8	21.9	17.64	0	7.70	8.61	2.11	2.15	NA	NA	NA	NA	NA	NA	NA	NA
West Bengal	Low-input farmers	38.41	49.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11.8	16.5
	Mid-to-high-input farmers	32.80	51.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.31	24.4
	Non-farmers (Control)	23.7	32.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11.09	16.0

Source: Own compilation

Table 2.14 focuses on the state wise production during the Kharif season. For paddy as a main product Madhya Pradesh has the highest production whereas the least is recorded for Himachal Pradesh. For vegetables, it is Gujarat followed by Maharashtra and Assam. Highest production of maize is recorded in the state of Gujarat. If we see state wise, Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal have the highest production of Paddy. Gujarat, Himachal Pradesh and Maharashtra have the maximum production of Vegetables. Karnataka records highest production of pulses across other crop varieties.

Chapter 3

Insurance Behavior

Introduction

This part of the project focuses on insurance behavior among the farmers across various states. It covers various parameters such as awareness about PMFBY, the various mechanisms for the information and the role of various agencies in implementing the scheme across different states. This allows us to understand the effectiveness of the schemes in different states and helps in identifying some areas for improvement. Thus, the results help for the better implementation at the grass root level taking into consideration farmers' views.

3.1. Findings

The data comes from primary surveys conducted in nine Indian States (Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Uttar Pradesh, and West Bengal). There is an attempt to cover all major Indian geographical, although we do not claim a perfect representation. This also gives a picture of effectiveness of the schemes in different parts of India.

Table 3.1: Awareness of PMFBY

State	Category	Number of Farmers	Yes	No	NA
Assam	Loanee	100	100 (100)	0 (00)	0 (00)
	Non-loanee	10	10 (100)	0 (00)	0 (00)
	Non-Insured (Control)	40	40 (100)	0 (00)	0 (00)

State	Category	Number of Farmers	Yes	No	NA
Bihar	Loanee	124	98 (79.03)	22 (17.74)	4 (3.23)
	Non- loanee	0	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	31	31 (100)	0 (00)	0 (00)
Gujarat	Loanee	110	79 (71.82)	31 (28.18)	0 (00)
	Non- loanee	10	10 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)
Himachal Pradesh	Loanee	99	95 (95.51)	4 (4.49)	0 (00)
	Non- loanee	31	31 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)
Karnataka	Loanee	90	47 (52.22)	13 (14.44)	30 (33.33)
	Non- loanee	30	30 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)
Madhya Pradesh	Loanee	90	73 (81.11)	17 (18.89)	0 (00)
	Non- loanee	30	30 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)
Maharashtra	Loanee	51	43 (84.31)	7 (13.73)	1 (1.96)
	Non- loanee	73	72 (98.63)	0 (00)	1 (1.37)
	Non-insured (Control)	33	33 (100)	0 (00)	0 (00)
Uttar Pradesh	Loanee	90	86 (95.56)	4 (4.44)	0 (00)
	Non- loanee	30	30 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)

State	Category	Number of Farmers	Yes	No	NA
West Bengal	Loanee	90	65 (72.22)	25 (27.78)	0 (00)
	Non- loanee	30	30 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)

Source: Own Compilation

Table 3.1 deals with awareness about the scheme among different categories of the farmers in all the states surveyed. The state of Assam shows the highest level of awareness (100 per cent) in loanee category followed by Uttar Pradesh (96.56) Himachal Pradesh (95.31), Maharashtra (84.31), and Madhya Pradesh (81.11) whereas the farmers of Karnataka (52.22) were the least aware about the scheme.

Table 3.2 focuses at the insurance history of the farmers, for instance, if they were insured earlier under the schemes like National Agricultural Insurance Scheme (NAIS) or modified NAIS (MNAIS) or Weather Index-Based Crop Insurance in India (WBCIS).

Table 3.2: Availed any crop insurance scheme earlier

State	Category	Total number of farmers surveyed	Yes	No	NA
Assam	Loanee	100	0 (00)	100 (100)	0 (00)
	Non- loanee	10	0 (00)	10 (100)	0 (00)
	Non-insured (Control)	40	0 (00)	25 (62.5)	15 (37.5)
Bihar	Loanee	124	9 (7.26)	111 (89.52)	4 (3.22)
	Non- loanee	0	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	31	0 (00)	0 (00)	31 (100)
Gujarat	Loanee	110	77 (70)	33 (30)	0 (00)
	Non- loanee	10	10 (100)	0 (00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)

State	Category	Total number of farmers surveyed	Yes	No	NA
Himachal Pradesh	Loanee	89	28 (31.46)	61 (68.54)	0 (00)
	Non-loanee	31	10 (32.26)	21 (67.74)	0 (00)
	Non-insured (Control)	30	0 (00)	30 (100)	0 (00)
Karnataka	Loanee	90	44 (48.89)	16 (17.78)	30 (33.33)
	Non-loanee	30	0 (00)	30 (100)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Madhya Pradesh	Loanee	90	8 (8.89)	82 (91.11)	0 (00)
	Non-loanee	30	2 (6.67)	28 (93.33)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Maharashtra	Loanee	91	28 (54.90)	26 (28.22)	3 (3.86)
	Non-loanee	73	47 (64.38)	23 (31.51)	3 (4.11)
	Non-insured (Control)	33	0 (00)	0 (00)	33 (100)
Uttar Pradesh	Loanee	90	22 (24.44)	68 (75.56)	0 (00)
	Non-loanee	30	5 (16.67)	25 (83.33)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
West Bengal	Loanee	90	41 (45.56)	48 (53.33)	1 (1.11)
	Non-loanee	30	11 (36.67)	19 (63.33)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)

Source: Own compilation

The results show that the Gujarat (70), Maharashtra (54.90), Karnataka (48.89) and West Bengal (46.56) are the states where farmers under loanee category had insurance earlier under NAIS. On the other hand, Assam had no loanee farmer insured earlier under any insurance scheme. Similarly, States like Assam, Bihar, Madhya Pradesh, Uttar Pradesh and Himachal Pradesh had very less number of loanee farmers insured under previous insurance schemes.

Similar trend is observed under non-loanee category for Gujarat (100) and Maharashtra (64.38) whereas Karnataka and West Bengal had very less percentage of non-loanee category farmers insured under NAIS*. A similar trend is observed for Assam (0), Madhya Pradesh (6.67) and Uttar Pradesh (16.67). Table 3.2 and 3.3 helps us to compare the insurance rates under NAIS and PMFBY. For instance, the states that were not very well covered under NAIS had a higher coverage under the loanee category, such as, Assam (100), Uttar Pradesh (97.78), and Himachal Pradesh (95.31). Of course, there are states like Gujarat that were very well covered both under NAIS and PMFBY. The farmers in Bihar under loanee category were unsure under which scheme they are insured. This indicates the need for the better awareness campaigning through various medium of information. Even in the category of non-loanee farmers are not sure under which scheme they are covered hence it demands a greater role for awareness programme through the medium which are accessible by the farmers.

Table 3.3: Insured under PMFBY

State	Category	Number of Farmers	Yes	No	Unsure	NA
Assam	Loanee	100	100 (100)	0 (00)	0 (00)	0 (00)
	Non- loanee	10	10 (100)	0 (000)	0 (00)	0 (00)
	Non-insured (Control)	40	0 (00)	25 (62.50)	0 (00)	15 (37.50)
Bihar	Loanee	124	25 (20.16)	0 (00)	95 (76.61)	4 (3.23)
	Non- loanee	0	0 (00)	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	31	0 (00)	0 (00)	0 (00)	31 (100)
Gujarat	Loanee	110	110 (100)	0 (00)	0 (00)	0 (00)
	Non- loanee	10	10 (100)	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	30	30 (100)	0 (00)	0 (00)	0 (00)

*Comparisons of PMFBY with NAIS and previous schemes are done only in the states where both were adopted.

State	Category	Number of Farmers	Yes	No	Unsure	NA
Himachal Pradesh	Loanee	89	88 (98.91)	1 (1.12)	3 (3.37)	0 (00)
	Non- loanee	31	30 (96.77)	0 (00)	1 (3.23)	0 (00)
	Non-insured (Control)	30	0 (00)	30 (100)	0 (00)	0 (00)
Karnataka	Loanee	90	9 (10.00)	51 (56.67)	0 (00)	30 (33.33)
	Non- loanee	30	0 (00)	0 (00)	30 (100)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	30 (100)
Madhya Pradesh	Loanee	90	64 (71.11)	26 (28.89)	0 (00)	0 (00)
	Non- loanee	30	27 (90.00)	0 (00)	3 (10.00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	30 (100)
Maharashtra	Loanee	51	35 (68.62)	7 (13.73)	7 (13.73)	2 (3.92)
	Non- loanee	73	59 (80.82)	0 (00)	12 (16.44)	2 (2.74)
	Non-insured (Control)	33	0 (00)	0 (00)	0 (00)	33 (100)
Uttar Pradesh	Loanee	90	88 (97.78)	2 (2.22)	0 (00)	0 (00)
	Non- loanee	30	30 (100)	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	30 (100)
West Bengal	Loanee	90	53 (58.89)	9 (10.00)	26 (28.89)	2 (2.22)
	Non- loanee	30	17 (56.67)	0 (00)	13 (43.33)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	30 (100)

Source: Own compilation

From tables 3.1 and 3.2 it is clear that the farmers need more awareness. Through table 3.4, we will be looking at the contribution of the various agencies that helped in spreading awareness among the farmers.

Table 3.4: Medium of Information

State	Category	Government Awareness Programme	Insurance agent	Pan-chay-yat	Other village	Others				NA
						Bank	News	Other than these	Total	
Assam	Loanee	10	0	0	12	78	0	0	78	0
	Non-loanee	10	0	0	0	0	0	0	0	0
	Non-insured (Control)	0	0	0	6	0	1	0	1	33
Bihar	Loanee	6	0	0	7	5	0	0	9	102
	Non-loanee	0	0	0	0	0	0	0	0	0
	Non-insured (Control)	0	0	0	0	0	0	0	0	31
Gujarat	Loanee	35	0	17	25	0	0	0	52	0
	Non-loanee	9	0	0	2	0	0	0	1	0
	Non-insured (Control)	0	0	0	0	0	0	0	0	30
Himachal Pradesh	Loanee	55	3	11	1	4	3	0	7	16
	Non-loanee	28	6	4	0	0	0	0	0	2
	Non-insured (Control)	0	0	0	0	0	0	0	0	30
Karnataka	Loanee	3	0	23	12	0	0	0	0	46
	Non-loanee	0	0	0	0	0	0	0	0	30
	Non-insured (Control)	0	0	0	0	0	0	0	0	0
Madhya Pradesh	Loanee	29	9	10	11	0	0	0	31	0
	Non-loanee	8	4	2	7	0	0	0	11	0
	Non-insured (Control)	0	0	0	0	0	0	0	0	30
Maharashtra	Loanee	22	2	26	22	1	0	3	4	5
	Non-loanee	26	0	39	48	0	1	0	1	4
	Non-insured (Control)	0	0	0	0	0	0	0	0	0

State	Category	Government Awareness Programme	Insurance agent	Pan-chay-yat	Other village	Others			NA	
Uttar Pradesh	Loanee	77	6	3	0	0	0	0	2	2
	Non-loanee	28	1	0	0	0	0	0	0	0
	Non-insured (Control)	0	0	0	0	0	0	0	0	0
West Bengal	Loanee	5	5	85	20	0	0	0	30	0
	Non-loanee	0	0	36	16	0	0	0	0	0
	Non-insured (Control)	0	0	0	0	0	0	0	0	0

Source: Own compilation

Government awareness programs had been conducted in various parts of India about the scheme. Among the surveyed states it seems that it played a very important role in Gujarat, Himachal Pradesh, Madhya Pradesh, Maharashtra and Uttar Pradesh. It is clear that the government has taken strong initiatives there; but in states like West Bengal, Karnataka, Bihar and Assam, more government awareness programs are needed.

Other agencies like banks and panchayats also played a major role in spreading awareness about the scheme. In the case of West Bengal, the panchayat played a significant role whereas in Assam it is the banks which have played a more important role. There are variations from state to state which suggest that in the states of Assam, Bihar, Gujarat, Madhya Pradesh, Himachal Pradesh and Uttar Pradesh panchayats should play a more active role while in the states of Uttar Pradesh, Maharashtra, Karnataka, and Himachal Pradesh, banks should ramp up their awareness drives. A striking feature is that the roles of insurance agents have not been very prominent in most of the states. This deserves greater attention as the take-up of insurance especially in the non-loanee category very much depends on insurance agents and their activities.

Table 1.5: Satisfaction level

State	Category	Number of Farmers	Yes	No	NA
Assam	Loanee	100	73 (73)	27 (27)	0 (00)
	Non-loanee	10	10 (100)	0 (00)	0 (00)
	Non-insured (Control)	40	0 (00)	0 (00)	40 (100)
Bihar	Loanee	724	10 (8.06)	110 (88.71)	4 (3.23)
	Non-loanee	0	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	31	0 (00)	0 (00)	31 (100)

State	Category	Number of Farmers	Yes	No	NA
Gujarat	Loanee	110	26 (23.64)	49 (44.55)	35 (31.82)
	Non- loanee	10	7 (70.00)	3 (30.00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Himachal Pradesh	Loanee	89	30 (33.71)	59 (66.29)	0 (00)
	Non- loanee	31	6 (19.35)	25 (80.65)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Karnataka	Loanee	90	45 (50.00)	15 (16.67)	30 (33.33)
	Non- loanee	30	0 (00)	30 (100)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Madhya Pradesh	Loanee	90	9 (10.00)	81 (90.00)	0 (00)
	Non- loanee	30	1 (3.33)	29 (96.67)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
Maharashtra	Loanee	91	25 (49.02)	19 (37.25)	7 (13.73)
	Non- loanee	73	38 (52.05)	32 (43.84)	3 (4.11)
	Non-insured (Control)	33	0 (00)	0 (00)	33 (100)
Uttar Pradesh	Loanee	90	50 (55.56)	40 (44.44)	0 (00)
	Non- loanee	30	18 (60.00)	12 (40.00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)
West Bengal	Loanee	90	33 (36.67)	57 (63.33)	0 (00)
	Non- loanee	30	7 (23.33)	23 (76.67)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	30 (100)

Source: Own compilation

In many states such as Assam, Bihar, Gujarat, Himachal Pradesh, Madhya Pradesh, and West Bengal, farmers demanded timely compensation. Farmers in these states also suggest reducing the time taken for paper work completion and to lower the premium amounts. In some states, less time to finish paper work (Maharashtra) and lower premium (Uttar Pradesh) is more preferred over timely compensation. The other suggestions across states include higher compensation, transparency in the scheme, more awareness programs, inclusion of loss of animals and the increasing role of panchayat.

Table 3.6: Overall experiences

State	Category	Total Number	Better than earlier schemes	Worse than earlier schemes	Same as any of the earlier schemes	Never insured earlier	Can't say	NA
Assam	Loanee	100	0 (00)	0 (00)	0 (00)	75 (75)	25 (25)	0 (00)
	Non-loanee	10	0 (00)	0 (00)	0 (00)	8 (80)	2 (20)	0 (00)
	Non-insured (Control)	40	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	40 (100)
Bihar	Loanee	124	22 (17.74)	6 (00)	10 (8.01)	64 (51.61)	24 19.35	4 3.23
	Non-loanee	0	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)
	Non-insured (Control)	31	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	31 (100)
Gujarat	Loanee	110	50 (45.45)	7 (6.36)	10 (9.09)	40 (36.36)	3 (2.73)	0 (00)
	Non-loanee	10	7 (70)	2 (20)	0 (00)	0 (00)	1 (10)	0 (00)
	Non-insured (Control)	38	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	38 (100)
Himachal Pradesh	Loanee	89	41 (46.07)	11 (12.36)	15 (16.85)	4 (4.49)	18 (20.22)	0 (00)
	Non- loanee	31	11 (35.48)	5 (16.13)	4 (12.90)	2 (6.45)	9 (29.00)	0 (00)
	Non-insured (Control)	50	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	50 (100)

State	Category	Total Number	Better than earlier schemes	Worse than earlier schemes	Same as any of the earlier schemes	Never insured earlier	Don't say	NA
Karnataka	Loanee	90	34 (37.78)	0 (00)	0 (00)	10 (11.11)	8 (8.89)	38 (42.22)
	Non-loanee	30	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	30 (100)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	30 (100)
Madhya Pradesh	Loanee	90	26 (28.89)	0 (00)	64 (71.11)	0 (00)	0 (00)	0 (00)
	Non-loanee	30	4 (13.33)	0 (00)	25 (83.33)	1 (3.33)	0 (00)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	30 (100)
Maharashtra	Loanee	51	28 (54.90)	2 (3.92)	2 (3.92)	2 (3.92)	14 (27.45)	3 (5.88)
	Non-loanee	73	41 (56.16)	11 (15.07)	9 (12.33)	0 (00)	8 (10.96)	4 (5.48)
	Non-insured (Control)	33	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	33 (100)
Uttar Pradesh	Loanee	90	47 (52.22	0 (00)	2 (2.22)	32 (35.56)	7 (7.78)	2 (2.22)
	Non-loanee	30	9 (30)	0 (00)	1 (3.33)	18 (60)	2 (6.67)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	30 (100)
West Bengal	Loanee	90	24 (26.67)	0 (00)	1 (1.11)	40 (44.44)	23 (25.56)	2 (2.22)
	Non-loanee	30	4 (13.33)	0 (00)	0 (00)	21 (70.00)	5 (16.67)	0 (00)
	Non-insured (Control)	30	0 (00)	0 (00)	0 (00)	0 (00)	0 (00)	30 (100)

Source: Own compilation

Table 3.6 looks at the overall experience with the PMFBY scheme. From our results (Table 3.6) it is observed that the farmers of Gujarat, Himachal Pradesh, Maharashtra and Uttar Pradesh feel that this scheme is better than the previous scheme. Farmers in Bihar, Assam and West Bengal are unsure about their experiences as they were not insured earlier, whereas farmers from Madhya Pradesh generally felt that PMFBY was not very different than the earlier schemes.

3.2. Conclusions

As far as perceptions go, PMFBY has achieved success in many states but also has scope for a better acceptance among the intended stakeholders. The insights presented here can help in making further improvements for a greater take-up of this very important intervention aimed at farmers' welfare. Leveraging cooperative federalism i.e. seeking more and more involvement of the state, district and village level agencies can enhance the efficiency of the scheme and its take-up.

Chapter 4

Willingness-To-Pay

Introduction

This component of the project[1] aimed to primarily focus on the assessment of demand for agriculture insurance, considering the highly popularized Pradhan Mantri Fasal Bima Yojana. Our research has been exploring novel strategies for providing comprehensive risk management solutions to farmers without relying on such massive public expenditures. To this end, this part of the project aimed to elicit farmers' willingness to pay using discrete choice experiments (DCEs), a stated preference method in which preferences are estimated based on participants' responses to hypothetical market scenarios. These survey-based exercises are referred to as experiments because the researcher controls the combination of product characteristics to which the survey participant is exposed. This methodology allows us to better understand Indian farmer's preferences for various crop insurance packages or elements of crop insurance packages in a way not typically feasible using other means. In particular, we are interested in better understanding farmers' preferences for insurance coverage period, method of yield loss assessment, total sum insured, levels of actuarially fair premium rates and timing of insurance payouts. While our choice sets are agnostic to any specific insurance scheme, they include what are believed to be all the important attributes that are present in the current large-scale new insurance program in India, as well as some features that could rather easily be integrated into this program. Thus, our results not only contribute to the broader literature on WTP for multi-peril crop insurance, but are also valuable for Indian policymakers in their efforts at optimizing insurance design.

[1] This chapter has been written and compiled based on contributions of Patrick Ward (Duke-NUS Medical School), Vasundhara Singh (IFPRI), Shweta Gupta (IFPRI) and India team.

4.1. Literature

A fundamental question that has bothered scholars, policy makers and markets alike over the past few decades is: how valuable is crop insurance for farmers? In developed countries, there is no evidence to suggest that risk aversion among farmers is high enough to pay for purely private actuarial premiums (Goodwin, 2001; Smith and Glauber, 2012). Patrick (1988) found almost negligible willingness to pay full costs of offering insurance above the actuarially fair premium, and no buyers in the instance of loading factor exceeding 20 percent. In another assessment, farmers were not willing to pay higher than 5 percent of the actuarially fair premium (Bardsley et al., 1984). In developing countries, crop insurance is one of the many tools governments use to smooth farm incomes, in addition to policy mechanisms such as quotas, minimum support prices, input subsidies, and low interest agricultural loans, among others (Mahul and Stutley, 2010). In the presence of these, it is difficult to find out what is the real demand for insurance. Some options may also promote moral hazard where a combination of high input subsidy, low interest loans and insurance leads to poor management practices in a low investment - assured return setting (Hazell and Hess, 2010). In South Asia, a peculiar interaction further complicates the understanding of insurance demand: forgiveness of agricultural credit. This hampers the loan repayment culture and the solvency of banks (Report GoB, 2009) while simultaneously failing to translate increased liquidity into higher agricultural investments or productivity (Kanz, 2016). In some recent interactions with farmers in the Indian state of Karnataka, the authors discovered that indebted farmers do not visit rural banks (that are in-charge of managing insurance). This is out of both a fear of having to repay a loan and the hope that there will be a political intervention during an election cycle whereby outstanding loans would be forgiven in an attempt to shore up support among rural communities (Ghosh, 2018)

Consequently, estimating insurance demand through observed prices (in this case, premium rates) may not paint a complete picture about the potential for or constraints within rural financial markets. Therefore, in recent times, there have been some, though very limited, efforts to estimate demand or the WTP for insurance using direct valuation methods, such as contingent valuation (CV) or DCEs. Arshad et al. (2016) performed a double-bound dichotomous choice-based CVM to elicit WTP insurance premiums in a hypothetical insurance market for two extreme weather events, floods and droughts. The experimental sample consisted of 240 farmers from across 12 agro-climatic zones of Pakistan. Only 28.44% of respondents were willing to opt for insurance which meant a very low WTP of 627 PNR (Pakistani rupees) per year per acre of land for drought and PNR 659 per year per acre for floods. The WTPs were inversely related to the bid values and accesses to canal irrigation, whereas were directly related to incomes. Although low in values, positive WTPs for crop insurance confirmed that there is a potential to develop agricultural insurance markets in Pakistan. Liesivaara and Myyrä (2017) conducted a split sample DCE to include disaster aid as a constant variable in estimating

WTP for different attributes of a crop insurance product in Finland. They found that expectations of disaster relief meant farmers would be less worried about crop losses. In such a situation, premiums would have to be highly subsidized for insurance take-up implying expansive use of taxpayers' money for very low marginal benefits. Essentially, the government would be better off spending either on premium subsidies or on disaster relief, but not on both.

The Liesivaara and Myyra (2017) study evaluates attributes of an insurance product, but the relevance of the insights are largely limited to the EU context. Moreover, the focus has been on interaction with ex-risk mitigation options. Other studies (e.g., Arshad et al., 2016; Fahad and Jing, 2018, both in Pakistan) give meaningful insights for insurance demand in a developing country context, but have limitations of their own. First, the assessment is for two named perils, floods and droughts, thus limiting insights on multi-peril insurance products. Second, they adopt a holistic CV approach which can only speak generally of WTP for insurance. This approach yields little insight on farmers' valuations for various features of insurance contracts (such as coverage period, timeliness of indemnity payments, or loss assessment), and thereby does not help in optimizing insurance design. An assessment of WTP for multi-peril insurance in India, that also evaluates the preferences for attributes, is therefore, invaluable to understand insurance demand behavior in developing countries more comprehensively. This is especially true in a context where one of the largest governments subsidized multi-peril insurance programs in the world is currently operational. It provides an opportunity to validate outcomes and experiment with optimized insurance design.

4.2. Methodology

As has been discussed, discrete choice experiments allow researchers to analyze stated preferences for products or services, but beyond that they allow researchers a means for parsing out preferences for specific characteristics or attributes of a good or service. This is particularly useful if the researcher believes, as Lancaster (1966) suggested, it is not the good or service that is the object of utility, but rather it is from the underlying characteristics of the good or service from which utility is derived. In a discrete choice experiment, preferences are elicited through survey participants' responses to a series of hypothetical choice scenarios. These survey-based exercises are referred to as experiments because the researcher controls the combination of product characteristics to which the survey participant is exposed.

It is typically assumed that observed choices arise from a process of random utility maximization (McFadden, 1974). Specifically, within the context of a discrete choice experiment, it is assumed that the observed (stated) choice that an individual makes within a particular choice scenario is the choice that, on average, maximizes her utility among the set of potential alternatives. Utility consists of both a systematic (deterministic) component, and a stochastic component. The deterministic component

reflects individual tastes and preferences that map the expression of product characteristics directly into utility, while the stochastic component reflects, among other things, random variations in tastes and preferences and errors in optimization. We can write our random utility model as:

$$u_{ijt}^{*} = x_{ijt}\beta_i + \varepsilon_{ijt} / \sigma_i \tag{1}$$

where u_{ijt}^{*} is the observed indirect utility (i.e., the utility of the utility maximizing option j) obtained by individual i during choice scenario t; x_{ijt} is a vector of insurance policy characteristics or attributes; β_i is a vector of preference weights; ε_{ijt} is a mean zero, independently and identically distributed error term, and σ_i is a scale factor. It is not possible to separately identify σ_i, so in standard practice it is assumed that σ_i can be normalized to 1. Taking partial derivatives of u_{ijt}^{*} with respect to the attributes provides estimates for the change in utility associated with incremental changes in the expression of the attributes; in other words, the β_i terms can be directly interpreted as marginal utilities. The ratio of two marginal utilities is directly interpretable as the marginal rate of substitution between the two attributes (i.e., the rate at which an individual would be willing to give up a unit of the attribute in the denominator to acquire an increment of the attribute in the numerator). If one of the marginal utilities is the marginal utility of income, then the marginal rate of substitution with respect to income is an estimate of WTP. We are rarely able to directly observe the marginal utility, but this can be proxied by the marginal disutility of product cost. Since cost is almost always deemed to be one of the important features driving purchase decisions, it is almost universally included as an attribute in a DCE. An estimate for the WTP for a specific attribute would therefore just be the ratio of the marginal utility of the attribute to the marginal disutility of product price.

If one assumes that preferences are fixed in the population, then estimating marginal utilities and arriving at estimates for WTP is relatively straightforward using conditional logit estimation. The assumption of fixed (or constant) preferences in the population is quite restrictive, however, and imposes some potentially unrealistic assumptions on, among other things, the substitution patterns that are permitted by the model. A common approach to incorporating preference heterogeneity is to estimate the choice model using a mixed logit (also known as a random parameter logit) model. Under this approach, the researcher assumes a distribution for the preference parameters, and derives an estimate for WTP as the ratio of the random parameters. This approach, however, can lead to distributions for WTP that have undefined moments (e.g., the ratio of two normally distributed random variables takes a Cauchy distribution, for which neither the mean nor the variance is defined). Train and Weeks (2005) suggested a modification to equation (1) in which the underlying utility model is re-parameterized and specified in willingness-to-pay space rather than preference space. In particular, we can re-write the utility function as:

$$u_{ijt} = \alpha_i[\beta_{ip} - \kappa_{ip}\gamma_i] + \varepsilon_{ijt} \quad (2)$$

where p_{ijt} is the price of option j faced by individual i during choice scenario t, and $\gamma_i = \beta_{ij}/\alpha_i$. Now, rather than assuming the distributions for the marginal utilities, the researcher can directly specify the distribution for WTP without having to worry about ratio distributions with undesirable properties. This model can then be estimated by appealing to the generalized multinomial logit (GMNL) model developed by Fiebig et al. (2010), which Hensher and Greene (2010) have demonstrated is a generalization of choice models estimated in both preference space as well as WTP space.

To allow for even greater flexibility in estimation, we consider the possibility that the randomly distributed WTPs for the different insurance product attributes could be correlated. As was previously mentioned, if there is scale heterogeneity, then WTPs will be correlated by definition, and even if there is no scale heterogeneity, there is the possibility for correlated WTPs simply due to correlation among preferences for different attributes. Hensher, Rose, and Greene (2015) have further noted that, in virtually all data sets, there are likely unobserved effects that are correlated among alternatives in a given choice situation and allowing for WTP parameters to be correlated is one way to account for this. Failing to control for this can lead to imprecise estimates of WTP, which has obvious implications for the reliability of the policy implications that be derived from these estimates (Mariel & Meyerhoff, 2018).

In the present study, our principal interest is to evaluate Indian farmers' preferences for various elements of crop insurance. While there are potentially innumerable different dimensions with which to characterize and differentiate insurance products, to maintain tractability we are necessarily limited in the scope of attributes over which we can attempt to elicit preferences. As such, we narrowed the field of potential attributes to those which we assumed would be particularly salient in farmers' minds when they evaluate risk management alternatives. We were interested in estimating farmers' preferences for the insurance coverage period, the method of loss assessment, the delivery of insurance payments, the coverage amount (referred to in the Indian context as the insured sum), and the cost of insurance. For the coverage period, there are several potential alternatives that insurance providers could consider. For example, under PMFBY, insurance covers the entire period from pre-sowing until after harvest. Other alternatives could include only the period from sowing until harvest, or merely pre-sowing or post-harvest. We also included in our experiment a variable capturing the insured sum of the hypothetical insurance policies.

Table 4.1: Attributes and attribute levels included in discrete choice experiment

Attribute	Levels			
Coverage period	Pre-sowing to post-harvest	Sowing to harvest	Pre-sowing only	Post-harvest only
Method of loss assessment	Crop-cutting exercise at village/panchayat	Remote-sensing (satellite) based metric	Rainfall-based index (pays out if rainfall less than 75 percent of historical average)	
Timing of insurance payments	Within six weeks of loss assessment (100 percent guaranteed)	50 percent change of payment within six weeks; 50 percent chance payment more than 6 months delayed		
Insured sum	INR 20,000/hectare	INR 30,000/hectare	INR 40,000/hectare	
Premium	2.5 percent of insured sum	4 percent of insured sum	10 percent of insured sum	

This is not because we were especially interested in preferences for larger policies versus smaller policies (we would assume a priori that larger payouts would be preferable to smaller payouts), but more so because we needed for there to be a baseline against which the study participants could evaluate the policy premium and the other insurance policy characteristics. In our experiment, we allowed for the insured sum to take three possible levels, specifically INR 20,000, INR 30,000, or INR 40,000 per hectare. Table 4.1 summarizes the various attributes of an insurance policy and their various level included in this experiment. Figure 4.1 below is a snapshot of 1 of the choice sets used in the experiment. 6 of each were faced by every respondent in the survey.

Figure 4.1: Example choice set

Note: Choice sets were translated in local languages (Hindi for Uttar Pradesh and Himachal Pradesh, Kannada for Karnataka, and Gujarati for Gujarat) to ensure respondents could read and interpret the choice sets with aid from the enumerators.

4.3. Data

The data used in the present study come from a household survey conducted across four Indian states (Gujarat, Himachal Pradesh, Karnataka, and Uttar Pradesh). Table 4.1 provides some basic characteristics of the households included in the sample. While not intended to be nationally representative, the diversity of state coverage allows for some heterogeneity in agro-ecological and social conditions. The survey and DCE were conducted from mid-February to mid-March 2018, with most agricultural questions

targeted toward kharif (monsoon season) 2017. Two staff members of the Agricultural Economics Research Centres (AERCs) from each of the states were trained in New Delhi for four days on the survey methodology, including the use of digital data collection methods (computer-assisted personal interviewing, or CAPI) and the specific CAPI software that would be used (SurveyCTO). We also partnered with a private survey firm to provide enumerator support to AERC staff in technical issues around the usage of tablets, data collection, monitoring and data transmittal to the central server. Daily monitoring of the field data was conducted by research staff from the International Food Policy Research Institute and Centre for Management in Agriculture to ensure that regular feedback was provided to the survey teams.

AERC staff surveying in Gujarat, Himachal, Uttar Pradesh

Table 4.2: Descriptive statistics of sample households

	Full Sample	Gujarat	Himachal Pradesh	Karnataka	Uttar Pradesh
Age	47.84	51.89	43.54	43.31	47.33
	(0.54)	(1.02)	(1.06)	(1.05)	(1.10)
Gender (proportion male)	0.86	1.00	0.59	0.69	0.97
	(0.01)	0.00	(0.04)	(0.03)	(0.01)
Farming experience (in years)	24.35	28.09	25.86	21.39	24.84
	(0.57)	(1.16)	(1.19)	(1.02)	(1.11)
General caste (proportion)	0.50	0.70	0.74	0.30	0.24
	(0.02)	(0.04)	(0.04)	(0.04)	(0.04)
Other backward class (proportion)	0.34	0.20	0.04	0.42	0.56
	(0.02)	(0.03)	(0.02)	(0.04)	(0.04)
Scheduled tribe/Scheduled caste (SC/ST proportion)	0.16	0.10	0.22	0.28	0.09
	(0.02)	(0.03)	(0.03)	(0.04)	(0.02)
Area cultivated during kharif 2017 (acres)	5.39	9.81	2.25	5.43	5.32
	(0.21)	(0.71)	(0.29)	(0.85)	(0.24)
Total grain harvested during kharif 2017 (tonnes)	4.99	8.82	1.43	6.22	3.54
	(0.53)	(1.52)	(0.50)	(1.31)	(0.33)

	Full Sample	Gujarat	Himachal Pradesh	Karnataka	Uttar Pradesh
Primary kharif crop is rice (proportion)	0.70	0.94	0.0112.988679	0.85	1.00
	(0.02)	(0.02)	(0.01)	(0.03)	0.00
Primary kharif crop is maize (proportion)	0.22	0.00	0.85	0.01	0.00
	(0.02)	0.00	(0.03)	(0.01)	0.00
Duration of primary crop from sowing to harvest (days)	119.83	122.59	106.04	142.91	106.67
	(1.24)	(1.91)	(2.15)	(2.80)	(1.33)
Insured during kharif 2017 (proportion)	0.11	0.11	0.06	0.14	0.14
	(0.01)	(0.03)	(0.02)	(0.03)	(0.03)
Insured in 2017 because loanee farmers (proportion)	0.09	0.11	0.08	0.08	0.12
	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)
Number of observations	572	142	144	142	144

Note: Standard errors in parentheses.

4.4. Findings

Table 4.3 produces the WTP estimates from the discrete choice experiment estimated by (1) scaled multinomial logit and (2) generalized multinomial logit. Results from the choice experiment suggest that farmers highly value full coverage for their cropping seasons, as indicated by the negative coefficients on the other coverage period attributes. Farmers would require significant discounts for policies covering only the pre-sowing or only the post-harvest periods, while demanding smaller discounts for policies covering the period from sowing to harvest. These results would indicate that farmers perceive some risk of crop loss due to sources apart from just rainfall (which, due to prevailing monsoon-season production practices, would presumably be covered by a policy covering the period from sowing to harvest).

Farmers have a clear preference for the prevailing loss assessment practice of crop-cutting exercises at the panchayat level. Consequently, they would require discounts for policies in which the method of assessment was either remote sensing or rainfall indices, though farmers seem less sensitive to alternative loss assessment methods than they do changes in the coverage period. This result has potentially important implications for overall insurance costs. Crop-cutting exercises are quite expensive to implement on any sort of scale, so although farmers would typically be willing to pay more for insurance policies backed by crop cutting assessments, the higher costs associated with these policies may impinge on insurers' profit margins. These other loss assessment methods are considerably less expensive, so although farmers are not willing to pay as much for these policies as they would those with losses determined by crop cutting exercises, such policies may prove to be more profitable on a per policy basis. Ultimately a more thorough analysis would be required to make such a determination.

Table 4.3: Utility function estimates from discrete choice experiment

	(1)	(2)
	S-MNL	DMNL
WTP FOR PRODUCT CHARACTERISTICS: -		
Coverage: Sowing to harvesting:	-5.991***	-6.977***
	(0.198)	(0.202)
Coverage: Pre-planting	-4.403***	-5.094***
	(0.4)	(0.474)
Coverage: Post-harvest	-4.531***	-4.807***
	(0.376)	(0.411)
Loss determination: Remote sensing	-0.245	-0.435**
	(0.186)	(0.194)
Loss determination: Rainfall index	-0.028	-0.433**
	(0.182)	(0.196)
Certainty of payment	1.06***	1.014***
	(0.185)	(0.185)
Sum insured	0.12***	0.099***
	(0.01)	(0.009)
hat: (Intercept)	1.136***	-0.212
	(0.072)	(0.175)
DISTRIBUTION OF WTP:		
SD (Coverage-Sowing to harvesting)		2.213***
		(0.314)
SD (Coverage- Pre-planting)		3.791***
		(0.461)
SD (Coverage-Post-harvest)		3.485***
		(0.396)
SD (Loss determination -Remote sensing)		2.061***
		(0.229)
SD (Loss determination -Rainfall index)		2.140***
		(0.258)
SD (Certainty of payment)		0.787*
		(0.351)
SD (Sum insured)		0.054***

	(1)	(2)
	S-MNL	GMNL
		(0.015)
Tau		1.152***
SD (Tau)		(0.163)
Log likelihood function value	-3164.249	-3041.631
Number of iterations	8	187
Number of Halton draws used	1	1000
Number of choice observations (N)	3432	3432
Number of choice sets per individual (K)	6	6
Number of individuals (N/K)	572	572

Standard errors in parentheses

***Significant at 1 percent; **Significant at 5 percent; *Significant at 10 percent

We find that farmers are willing to pay a significant premium for insurance if they could believe that payments would be timely (i.e., guaranteed within six weeks of loss assessment). Concerns about payment delivery are likely one of the factors constraining the diffusion of insurance, as can be seen in the current experiences under PMFBY. With other potential methods of loss assessment available that could speed up the turnaround time, it may be possible for insurance providers to guarantee more timely insurance payments, thereby re-capturing some of the cost of insurance that might have been lost due to offering discounts for remotely-sensed or index-based loss assessments.

Finally, the estimates suggest that farmers would be willing to pay significantly higher premiums than they currently are asked to pay overall. We find that on average, farmers would be willing to pay nearly a 10 percent premium for a policy like the existing policies being offered under PMFBY. This premium amount is still low relative to what would likely be needed for insurance (especially an indemnity-based insurance product with high administrative and loss assessment costs) to be commercially viable but is still nearly 4 times higher than the premiums they are currently paying under PMFBY. At the same time, the results from the distribution of utility parameters suggest that there is presence of heterogeneity in these estimates indicating several individual specific characteristics that need to be considered.

Chapter 5

Summary and Policy Insights

Any country that is serious about its developmental goals cannot ignore the importance of insuring farmers against unintended losses. Farming is the largest private enterprise of Indians. There are two key differences though: inputs and outputs are plagued with uncertainties of the highest order, unlike any other private business; moreover, the distribution, pricing and value chains are more of public goods, again unlike a traditional private business. So, farmers cannot be left to fight it out alone. Take the example of maize cultivation in Bihar, touted as a very promising crop for the state with high production value. Earlier this year, researchers from the government's Agro-Economic Research (AER) system had alerted that transport, logistics and processing plants need to be strengthened for maize markets in Bihar to thrive. Action was initiated on that front, with a processing plant also potentially making substantial investment. But as farmers ramped up cultivation hoping for a good season, a significant quantity of maize turned out not to have kernels (cobs)! Reportedly, several suicides in Bihar earlier this year have been linked to maize failure. This is agriculture in India. Post production uncertainties do not seem to be going away anywhere.

Insurance in such situation is a necessity. Moreover, given the low awareness and education level of farmers, it has to be mandatory. Wherever there are private players involved, there has to be an extra dose of regulatory supervision. Up to this point, the Pradhan Mantri Fasal Bima Yojana (PMFBY) has struck all the right cords. Unlike the previous schemes such as MNAIS, PMFBY has opened the possibilities for private insurers while cushioning the farmers with a very high premium subsidy, thus introducing competition. It follows an area-based approach, minimizing basis risk present in other indicator-based insurance schemes and covers a range of non-preventable risks from prevented sowing to post-harvest losses. As part of an exercise commissioned by the Ministry of Agriculture, and conducted by IIM Ahmedabad with the support of publicly funded Agro-Economic Research Centers (AERCs), we extracted district wise data in – Assam, Bihar, West Bengal, Uttar Pradesh, Himachal Pradesh,

Gujarat, Maharashtra, Madhya Pradesh and Karnataka, for the latest available year of PMFBY's implementation, that is- Kharif and Rabi, 2016-2017. We also collected state-level general statistics for the immediate past year 2017-18. In addition, we conducted primary surveys in several states (details provided in earlier chapters) to find out close approximation of what drives farmers towards insurance and how much are they willing to pay for purchase of multi-peril or named insurance products. The data (both primary and secondary) is collected up to March, 2018 and in some cases up to May, 2018. Hence our numbers, estimates and analysis do not cover the developments that have taken place beyond that period.

To summarize, a total of over 5.5 crore farmers were officially insured under PMFBY in 2016-17. Out of this, nearly 75% farmers got mandatory coverage if they had applied for any seasonal crop loans, premiums for which got deducted from the loan amounts. Twenty-five percent of the insured opted for insurance voluntarily. Among the sampled states, Maharashtra saw the highest enrollment followed by Uttar Pradesh and West Bengal, whereas states like Gujarat, Karnataka and Himachal Pradesh have witnessed very low uptake. A total cultivable area of roughly 3.8 crore hectare (Ha) has been insured. This means on an average, 1 Ha per farmer has been insured in the year 2016-17. The gross premium collected by insuring companies was Rs. 16,399 crores in Kharif season and Rs. 5,826 crores in Rabi, making it a total of Rs. 22,166 crores in year 2016-17 (Table 1). Private insurance companies share in this was Rs. 10,390 crores, nearly 46% of the total, whereas public agencies (primarily Agricultural Insurance Company, AIC) collected Rs. 11,774 crores or 54%. Out of the total gross premium collected, the insurance companies paid out Rs. 13,868 crores, as claims to beneficiary farmers. This makes the claims-to-premium (CP) ratio close to 62.5%. In Kharif the CP ratio was lower at 38.4%, but was a notch higher at 71.3% in Rabi. The CP ratio was nearly same for private as well as public agencies.

In 2017-18 (as recorded till 31.05.18), total farmers insured under the scheme was 5.01 crores (taking both Kharif and Rabi together). This is a reduction of 10.27% from the previous Year 2016-17. Assam, Jammu & Kashmir, Orissa, Karnataka and Meghalaya saw the highest gains in enrollment. Bihar, Goa, Kerala, Rajasthan and Uttar Pradesh saw a fall in enrollment. The total insured area decreased 13.27% to 4.89 crore Ha. The area insured per farmer in 2017-18 was 0.98 Ha. which is 0.02 Ha. lesser than 2016-17. The total sum insured under the scheme in year 2017-18 was Rs. 1.51 Lakh crores with a marginal 0.12% increase from 2016-17. The sum insured per farmer increased by Rs. 4,597 and sum insured per hectare increased by Rs. 3,580. The total premium collected by insuring agencies in year 2017-18 was Rs. 23,206.18 Crores, which was an increase of 13.6% compared to the previous year's collections. The average premium paid per farmer was Rs. 4,634 which was 20% higher than what farmers paid in 2016-17. Some significant additions in states have taken place in 2017-18. The most striking is Jammu & Kashmir, Assam, Kerala and Sikkim which saw major expansions as in most of these states PMFBY was implemented for the first time in the Kharif season, 2017. Around 1.46

lakh farmers in these states got insured for the first time during Kharif 2017. However, majority of the north-eastern states have yet to see any penetration of PMFBY.

Where PMFBY needs greater push is the implementation. For instance, the core edifice on which any successful crop insurance (or for that matter, any insurance) depends is accurate loss assessment. In the case of crop insurance, it is assessment of how much actual yields varied from average expected yields for a particular crop in a particular region. Given the tens of millions of small and medium sized farm plots in India, the only way to achieve this is to go for a rigorous sampling of plots and do yield assessment. In technical terms this is called as Crop Cutting Experiments (CCEs). Now, assuming, there are two plots selected per Gram Panchayat level (for the insured crop) at the end of every harvest season we will need 35–40 Lakh (3.5 to 4 million) CCEs, and all simultaneously—this simply means so many dedicated agricultural officers at one time performing a coordinated exercise.

Manual Crop Cutting Experiments (CCEs) are not only inadequate but also prone to human errors and manipulation by different stakeholders. During our field research in various states, we found that in many instances the primary agricultural workers side with the insurers in providing inflated yield data. Interestingly, in many places, farmers also manipulate yield assessment. When a farm is selected at the beginning of the sowing season as an experimental plot for CCEs, neighboring farmers bribe the selected farmer to ensure there is poor farm management practice and thereby low yield. Insurance agencies find it difficult to send their staff for each and every CCE as they do not have built-in local infrastructure or offices. A related problem faced by insurance agencies is formulating a long-term plan due to the lowest bid (L1) bidding system every year. Insurers have to offer lowest possible actuarial premiums, at the same time accounting for a variety of risks. This generates pressure on their management to prevent or delay claims by raising objections on yield data. Since the agencies are not sure if they will win the bids in the same region in the next season, they have hardly any incentive to set up rural infrastructure. This small operational window incentivizes short-term profit maximization and fly-by-night attitudes.

There are implementation issues on the farmer enrollment side as well. While PMFBY is mandatory for loanee farmers it is not always the case as, de-facto, farmers do have a choice to opt out even if they have taken seasonal agricultural loans. For instance, in low risk areas having good access to irrigation and inputs, farmers want to avoid paying premiums. In such cases, banks get a written consent from farmers that in the particular village panchayat level, PMFBY should not be implemented. In fact, we observed that there is a tendency for local rural banks to avoid implementing PMFBY. Reason? PMFBY puts additional burden on the already stressed IT infrastructure of the banks. This is also the main reason why claim disbursements are getting inordinately delayed, season after season. Unless banks upload the data to the Central Crop Insurance Portal (www.pmfby.gov.in) correctly the companies cannot demand it from the state government. Further, unless the state government gives the subsidy, central government won't

transfer its share of the 50% premium subsidy to the companies. This chain of delays provides a good basis for insurance companies to say (and genuinely in many instances) that they do not have the cash flow to transfer claims to farmers on time.

The gold standard for any insurance scheme is how many 'good risk' voluntary buyers it has because that is where actuarial gains are made. In Indian crop insurance, however, insurance companies have hardly any incentive (or the need) to increase enrollment of non-loanee farmers. Because they are not considered profitable due to short term and highly variable nature of the risks. In the minds of the insurers, a farmer opting for voluntary insurance is almost certainly very high risk and sure to claim compensation. Moreover, in the absence of their own local infrastructure, the enrollment has to be left to the banks, which are too burdened or disinterested to go out and scout for prospective customers. In any case banks have hardly anything to gain except a totally insignificant commissioning fee. Why I say insurance companies have hardly any need to go for voluntary enrollment? Because they can make decent premium earnings through the government subsidy in any case. So pure economics dictates that marginal returns from the extra efforts for increasing the customer base is not very high. In any case, the system of L1 bidding and state government intervention does not allow too much flexibility for companies to insure 'good risks'. This makes their business model unsustainable and they try to optimize by charging higher actuarial premiums. The position of the state governments is also not very clearly defined and they themselves are grappling with some existential issues: the 50% premium subsidy that it transfers to insurers is a pure dole out and does not come back in any form. When there are farm losses, insurers pay out to the farmers, and when not, they are booked as profits by them. So, for state governments, the risk cover through a high premium is seen as expenditure wasted and naturally, they are never in too much hurry to transfer the premium subsidies to the insurers.

If this is not complex enough, we need to understand that India is generally an insurance averse nation and farmers, especially, look for immediate short-term gains. In that comes PMFBY, which if it works, is a great option for them. For every 1 hectare and a sum insured of Rs. 35,000, insurance companies charge a premium of Rs. 4000. Out of this Rs. 3,300 is paid by government (center plus state) and only Rs. 700 is paid by farmers. If the scheme works perfectly well, then by paying Rs. 700, farmers can insure Rs. 35,000 worth of losses. Yet, the concept of risk smoothening is not understood by mostly low literate farmers. We also observed that farmers will be fine as long as there is some return to their premiums paid. But delayed claim payments reinforce negative perceptions further. Insurance companies made nearly a profit of Rs. 7,000 Crore in 2016-17 and enjoyed a net operating margin of 25%. The companies think this is not a sustainable margin as in a bad drought year, the losses and indemnity payments could go up to Rs. 30,000 Crore. No way any company will bid with a non-subsidized insurance product in agricultural sector as certainly there would be market failure. Yet, the fact that insurance companies made a profit generates negative perception because

this is profit made on perceived 'agrarian distress'. Moreover, it is government aided subsidy which ensures that insurance companies can operate under such high risk-high premium market, thereby making profits in good year. This further fuel the negative public perception. Are there ways to improve uptake, implementation and perceptions? We take it up in the final part of the article series. However, given the experience so far, there is hardly any doubt that PMFBY seems to be taking shaky steps, but in the right direction.

We then focus on what can be done to warrant higher acceptability and effectiveness. A new model of financial administration can be thought of which ensures companies make sustainable profits. According to one top expert this is akin to a 'cap-and-cup' approach. Insurance companies can carry the risk with a cap of, say, 120% and a cup of, say, 80%. Which means pure losses (claim ratio i.e., claim/premium) on the insurer's book beyond 120% falls on Centre and State at a pre-agreed ratio of 50:50 or 60:40, whereas surplus arising out of pure losses below 80% is ploughed back to the Centre and State in the same pre-agreed ratio. The Centre and State have to create a separate crop insurance fund (as there was during CCIS regime) which will be used only for crop insurance. The participating insurance company will be given parameterized target to perform and receive performance-linked-incentive or be penalized for below-par performance. Essentially, this means that in a profit year, insurance companies will plough back all the money beyond its normal capped profit to the PMFBY managed special fund. In a loss year, this fund can be used to compensate the company's losses. This will reduce the cost of re-insurance and ensure companies keep participating while farmers get assured claims when under losses.

Another vital plug is a higher reliance on technology for yield assessment, and not on humans. There have been many successful pilots using variation of technologies internationally (especially in Africa and South Asia), that have demonstrated that human intervention can be minimized, and relegated only to ground truthing of satellite or imagery data. Closer home, the Agricultural Insurance Company (AIC), India's largest crop insurer, has had a successful experience with using technology interventions in the RIICE project in Tamil Nadu. Satellite imagery and Remote Sensing Technology (RST) can provide area estimation of crop with 90% accuracy at village/ panchayat level. Combined with ground-truthing, reasonable yield assessment can be made. Several indices are already available: Normalized Difference Vegetation Index (NDVI), Normalized Difference Wetness Index (NDWI), Standard Precipitation Index (SPI), Vegetation Health Index (VHI), Leaf Area index (LAI). European Space Agency has come up with Sentinel Series (Copernicus Program). Crop signatures, protocols and auxiliary variables need to be developed. However, what is absolutely non-negotiable is that some scientific institution of high repute, capability and intent such as the National Remote Sensing Centre (NRSC) of Indian Space Research Organization (ISRO) has to lead it. No less credible, talented and independent an institution, which is also devoid of conflicts of interest can be trusted to carry this out. Certainly, no routine bureaucratic, quasi-scientific organization is capable of being an effective conduit.

On the agency front, rather than being focused on increasing the breadth of participation through bids from a higher number of private insurers, for the teething years there should be emphasis on deepening experience and expertise. Once companies with deep assets are empanelled, they should be given longer operational windows. The system of L1 bidding with high frequency does not generate incentive for long term investments in supporting infrastructure (especially by private companies) unless there is at least a three-year window. Such a short window is only full of moral hazards. There are several other improvements required such as faster processing or uploading of data through the web portal (which is a great enabler), re-assessing the role of coordination committees that should include independent experts, a big push in generating awareness of PMFBY, land record digitization to include tenant farmers and linking with Aadhar eventually. Bringing about these changes on a dynamic basis, cannot be left to the limited mind space of busy bureaucrats. It requires deeper institutional memory. Maybe it requires a strong, credible and independent institutional mechanism to be set up. This may require a legislation on agricultural insurance eventually, but for foundations to be strengthened and long run horizon in mind, steps in this direction will sooner or later become a compulsion. PMFBY is a good blend of a yield-index insurance product that takes care of systemic or covariate risks associated with widespread vagaries of weather as well as idiosyncratic losses. No scheme previously has offered such a comprehensive protection. With the indexed weather-based insurance products also struggling to maintain popularity, the field is all open for PMFBY to become the prime source of risk smoothening for the Indian farmers.

References

ARSHAD, M., AMJATH-BABU, T., KACHELE, H. & MÜLLER, K. 2016. What drives the willingness to pay for crop insurance against extreme weather events (flood and drought) in Pakistan? A hypothetical market approach. Climate and Development, 8, 234-244.

BARDSLEY, P., ABEY, A. & DAVENPORT, S. V. 1984. The economics of insuring crops against drought. Australian Journal of Agricultural Economics, 28:1, 1-14.

FAHAD, S. & JING, W. 2015. Evaluation of Pakistani farmers' willingness to pay for crop insurance using contingent valuation method: The case of Khyber Pakhtunkhwa province. Land use policy, 72, 570-577.

GOODWIN, B. K. 2001. Problems with market insurance in agriculture. American Journal of Agricultural Economics, 83.3, 643-649.

GOODWIN, B. K. & SMITH, V. H. 2003. An ex post evaluation of the conservation reserve, federal crop insurance, and other government programs: program participation and soil erosion. Journal of Agricultural and Resource Economics, 201-216.

Ghosh, R. K., 2018. Performance Evaluation of Pradhan Mantri Fasal Bima Yojana (Part 1): Governance Analysis. Center for Management in Agriculture (CMA), Indian Institute of Management Ahmedabad, India.

HAZELL, P. B. & HESS, U. 2010. Drought insurance for agricultural development and food security in dryland areas. Food Security, 2, 395-405.

HENSHER, D.A., ROSE, J.M., & GREENE, W.H. 2015. Applied choice analysis, 2e. Cambridge: Cambridge University Press.

KANZ, M. 2016. What Does Debt Relief Do for Development? Evidence from India's Bailout for Rural Households. American Economic Journal: Applied Economics, 8: 66-95.

LIESIVAARA, P. & MYYRÄ, S. 2017. The demand for public-private crop insurance and government disaster relief. Journal of Policy Modeling, 39, 19-34.

MAHUL, O. & STUTLEY, C. J. 2010. Government Support to Agricultural Insurance Challenges and Options for Developing Countries, the World Bank. Washington DC.

MARIEL, P. & MEYERHOFF, J. 2018. A more flexible model or simply more effort? On the use of correlated random parameters in applied choice studies. Ecological Economics 154: 419–429.

PATRICK, G. F. 1988. Mallee wheat farmers' demand for crop and rainfall insurance. Australian Journal of Agricultural Economics, 32.1, 37-49.

REPORT GOB. C. C. C. 2009. Crop insurance as a risk management strategy in Bangladesh. Department of Environment, Ministry of Environment and Forests. Government of the People's Republic of Bangladesh, Dhaka.

SAKURAI T. & REARDON, T. 1997. Potential demand for drought insurance in Burkina Faso and its determinants. American Journal of Agricultural Economics, 79, 1193-1207.

SMITH, V. H. & GLAUBER, J. W. 2012. Agricultural insurance in developed countries: where have we been and where are we going? Applied Economic Perspectives and Policy, 34.3, 363-390.

SMITH, V. H. & GOODWIN, B. K. 1996. Crop insurance, moral hazard, and agricultural chemical use. American Journal of Agricultural Economics, 78.2, 428-438.

SMITH, V. H. & GOODWIN, B. K. 2010. Private and public roles in providing agricultural insurance in the United States. Public Insurance and Private Markets, 173-210.

SMITH, V. H. & WATTS, M. 2010. The new Standing Disaster Program: A SURE invitation to moral hazard behavior. Applied Economic Perspectives and Policy, 32, 154-169.

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