Understanding the potential of crop insurance in India: A study of the Pradhan Mantri Fasal Bima Yojana (Prime Minister's Crop Insurance Scheme)

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Summary

The Pradhan Mantri Fasal Bima Yojana (PMFBY) is a crop insurance scheme introduced in Kharif 2016. It is a successor to schemes such as National Agriculture Insurance Scheme (NAIS), Modified National Agriculture Insurance Scheme (MNAIS), and is a multiple-peril, yield-based insurance scheme. PMFBY constitutes of new features/innovations, to improve the demand for crop insurance which has historically been low in India, such as:

a. capping the premium rate paid by farmers
b. employing mobile phone technology for faster estimation of yields
c. integrating enrolment information under one portal
d. greater integration of weather and yield data to better assess losses faced by farmers

In this study, we tried to gain an understanding of how the scheme is implemented, the role of stakeholders in the implementation process and how farmers view PMFBY. We adopted a mixed method approach where we employed qualitative instruments such as participant observation and semi-structured interviews of stakeholders to understand the process in detail; we analysed scheme-related official data to examine the pattern of enrolment/uptake of crop insurance and undertook a primary survey and focus group discussions with farmers in four taluks (sub-district level) in Karnataka to understand their experience of PMFBY.

The study site, Karnataka, a southern Indian state, presents an interesting case because of its diversity in terms of agro-climatic conditions (10 different zones), number of crops covered by the scheme (about 40 food and other crops) and also the perils faced.[1] In addition, the state is well-known as reform-oriented and planning to introduce a number of interventions to improve various components of the scheme to make it viable for the insurance providers and beneficial to the farmer. One such example is the development of a portal named *Samrakshane* which is interfaced with the land records database to facilitate the identification of famers thereby improving the enrolment and claim settlement process.

On the demand side, farmers were aware that crop insurance existed but not of the various features of this scheme. The delay in the results of the crop cutting experiments (CCEs) led to delay in disbursal of claims. This was due to the fact that a large number of CCEs were to be conducted in the shortest possible time and few results were contested by the insurance companies. However, enrolment in PMFBY has increased in 2017 over the previous year. Analysis of primary survey data from farmers indicated that lower premium rates, wide coverage of crops and faster settlement of claims make this scheme attractive and, if implemented properly, it has the potential to improve the trust and knowledge about crop insurance, in addition to resulting in the regular uptake of the crop insurance scheme.

Our findings also suggest that the Department of Agriculture (DoA) has taken a number of initiatives to improve the implementation of the scheme. The share has a high number of crops under coverage, has adopted mobile-based technologies and is testing new approaches to improve the implementation process. However, there are still a few gaps,

[1]As one of the Government official commented "If a crop insurance scheme can be implemented successfully in Karnataka, it can be implemented anywhere else in India and also perhaps in the rest of the word" (comment by an official at Department of Agriculture, Government of Karnataka, during Second Advisory Committee Meeting on September 23rd 2017).

such as the reliance on CCEs for yield estimates that involve lengthy processes, lack of awareness campaigns, high basis risk, and delay in disbursal of claims – all this hinders the demand for crop insurance. Enhancing the insured area coverage is the key for a sustained implementation of the scheme. Because of diverse agro-climatic zones and crops covered, the number of CCEs required is very high and the use of satellite imagery for direct estimation of crop yields could help reducing CCEs thereby enabling quicker yield estimation which in turn could help in the faster settlement of claims. Similarly, the improvement of awareness and a better understanding of its features among the farming community has potential to enhance the uptake of PMFBY. This intervention has increased the need for the greater accuracy of various forms of data like the crop sown area or crop productivity; this improvement of data quality has wider implications for agricultural policy.

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Abbreviations

AIC	Agricultural Insurance Company
APL	Above Poverty Line
APR	Actuarial Premium Rate
AY	Actual Yield
BPL	Below Poverty Line
CAG	Comptroller and Auditor General of India
CCE	Crop Cutting Experiments/ Exercises
CCIS	Comprehensive Crop Insurance Scheme
DCC	District Cooperative Central Bank
DES	Directorate of Economic and Statistics
DLMC	District Level Monitoring Committee
DLTC	District Level Technical Committees
DoA	Department of Agriculture

FGD	Focus Group Discussions
GIC	General Insurance Corporation
GoI	Government of India
GoK	Government of Karnataka
GIS	Geographical Information Systems
GPs	Gram Panchayat
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
ICV	Insured Crop Verification Exercises
IU	Insurance Units
KCC	Kissan Credit Card
KSNDMC	Karnataka State Natural Disaster Monitoring Centre
MFP	Minimum Floor Price
MNAIS	Modified National Agricultural Insurance Scheme
NAIS	National Agricultural Insurance Scheme
NIK	North Interior Karnataka
NFSM	National Food Security Mission
NHM	Non Hindu Minority
NMOOP	National Mission on Oilseeds and Oilpalm
NSSO	National Sample Survey Organisation
NMSA	National Mission for Sustainable Agriculture
OBC	Other Backward Caste
OECD	Organization for Economic Co-Operation and Development
PACS	Primary Agricultural Co-operative Societies
PCIS	Pilot Crop Insurance Scheme
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
RKVY	Rashtriya Krishi Vikas Yojana

RRBs	Regional Rural Banks
RST	Remote Sensing Technology
RTC	Records of Rights Tenancy and Crops
SAOL	Seasonal Agricultural Operations Loans
SC	Scheduled Caste
SIK	South Interior Karnataka
SLCCCI	State Level Coordination Committee on Crop Insurance
SSI	Semi Structured Interviews
ST	Scheduled Tribes
TY	Threshold Yield
WBCIS	Weather Based Crop Insurance Scheme

1 Introduction

In India, more than half the population continues to be dependent on agriculture, and about 67% of the all cultivators are small or marginal farmers who own less than one hectare of land. Further, as in many developing countries, agriculture is highly susceptible to fluctuations in weather, especially rainfall, which predominantly occurs during the months of June to September (i.e. *Kharif* season). Nearly, two-thirds of the cultivated area is dependent on rainfall; and those under irrigated areas do not have adequate water to undertake cropping activities during both *Kharif* and *Rabi* season continuously (Planning Commission, 2008). The recent years have also recorded lower mean rainfall and higher variability which has led to natural disasters such as floods, droughts and cyclones (Planning Commission, 2013). The impacts of variations in rainfall are not confined to the *Kharif*; the amount of precipitation also has an effect on soil moisture, which in turn has a significant impact on the growing of the *Rabi* crops (winter crop). In addition to weather risks, crops are also subject to other risks such as pests and diseases. These variations in weather and attacks by pests and diseases can cause considerable crop loss and uncertainty over decisions around agricultural production which in turn has a direct impact on the lives and livelihoods of a majority of the country's population.

Historically, crop insurance was largely confined to covering damages due to a single peril such as hail, offered by private insurance companies and taken mostly by large farmers for covering non-systemic risks. However, purely commercial insurance of this nature may not be viable in providing coverage against systemic risks for small or marginal farmers (Mahul and Stutley, 2010). Multiple-peril insurance programmes, therefore, arose out of the need to provide coverage against agricultural risks to subsistence, marginal and small farmers in the 1930s. It has since gained popularity across the world, especially in countries across Asia and Latin America, where a majority of cultivators own less than five hectares (Mahul and Stutley, 2010)

In India, crop insurance began with coverage of cotton by the General Insurance Corporation (GIC) on a very small scale during 1972-73. Since then, several crop insurance schemes have been introduced with significant changes in their features, as provided briefly in Table 1.1, with an objective to increase uptake of crop insurance, stabilise income and provide security to farmers' livelihoods.

Table 1.1: Crop Insurance in India - 1979 to 2016

Insurance Schemes	PCIS	CCIS	NAIS	MNAIS	WBCIS/RWBCIS	PMFBY
Year of Introduction	*Kharif* 1979	*Kharif*1985	*Rabi* 1999-2000	*Rabi* 2010-11	*Kharif* 2003 (WBCIS) *Kharif* 2016 (RWBCIS)	*Kharif* 2016
Targeted Crops	Cereals, Millets, Cotton, potato, and Oilseeds	Cereals, Millets, Pulses and Oilseeds	Food crops, Oilseeds, Annual Commercial/Horticulture crops	Notified crops, which will have CCEs	Major Food crops, Oilseeds, Horticulture/commercial crops In Karnataka, mainly horticultural crops are covered	Notified Major Food Crops, Oilseeds, Annual Horticulture/commercial crops
Approach	Yield-based Index	Yield-based Index	Yield-based Index	Yield-based Index and Rainfall Data	Weather-based Index	Yield-based Index and rainfall data, Also uses satellite imagery
Target Group	Voluntary for Loanee farmers	Compulsory for Loanee Farmers	Compulsory for Loanee farmers and voluntary for non-loanee farmers			
Insurance Company	General Insurance Corporation (GIC)	GIC	Agriculture Insurance Company of India Limited (AIC)	AIC and empanelled private sector insurance companies	Empanelled companies by the DoA, Government of India (GoI) and selected by concerned state government / union territory (UT).	Empanelled companies by the DoA, GoI and selected by concerned state government / UT.

Premium rates	0.80 claim premium ratio	2 percent cereals and millets, 1 percent pulses and oilseeds	*Kharif* 3.5% for oilseed crops and *bajra*, 2.5% for other food crops inclusive of pulses, *Rabi* 1.5% for wheat, 2% for other crops inclusive of pulses and oilseeds	Actuarial premium rates and net premium rates for each notified crop	Actuarial premium	Actuarial premium for notified crops: 2% of sum assured for *Kharif* crops and 1.5 % for *Rabi* crops. Same rates are applicable for oilseeds. For commercial crops like cotton and other horticulture crops, it will be 5% of the sum assured
Insurance unit (IU)	Homogeneous area	Homogeneous area	Scheme provided for reduction of unit to village/gram panchayat (GP)	Unit to be reduced to village / village panchayat (VP) or other equivalent unit for all crops	IU depends on availability of weather stations	GP for Major crops and *hobli* for minor crops

Note: PCIS - Pilot Crop Insurance Scheme; CCIS - Comprehensive Crop Insurance Scheme; NAIS - National Agriculture Insurance Scheme; MNAIS - Modified National Agriculture Insurance Scheme; WBCIS - Weather Based Crop Insurance Scheme; RWBCIS - Restructure Weather Based Crop Insurance Scheme; and PMFBY - Pradhan Mantri Fasal Bima Yojana

The PMFBY, introduced in 2016, is a successor to multiple-peril crop insurance schemes provided in India such as NAIS and MNAIS. These crop insurance schemes are usually subsidised by the government, providing coverage against production risk during various stages of the crop cycle.

The PMFBY is operational in 22 out of the 30 Indian states. Like the previous schemes, it employs an area approach for the calculation of losses due to certain risks. Losses are assessed on the basis of a yield-based index. The PMFBY tries to overcome some of the problems faced by previous schemes by:

a. capping the premium rate paid by farmers
b. employing mobile phone technology for faster estimation of yields
c. integrating enrolment information under one portal
d. greater integration of weather and yield data to better assess losses faced by farmers

Karnataka, a southern Indian state implementing the scheme, presents an interesting case because of the diversity that it has in terms of agro-climatic conditions (10 different zones), the number of crops covered (about 40 food and other crops)and also the perils faced. Administratively, Karnataka is also known to be a reform-oriented state and is planning to introduce a number of interventions to improve various components of the programme to make the scheme viable for the insurance providers and useful for the farmers. Therefore, an evaluation of PMFBY in Karnataka has the potential to inform not only this programme elsewhere but also other large schemes meant for providing security to a large number of small and marginal farmers dependent on monsoons.

At the moment, both PMFBY and WBCIS offer crop insurance to farmers in Karnataka. However, both schemes provide insurance for different crops - WBCIS is offered for horticultural crops (14 crops- *Kharif* 2017), whereas PMFBY is offered for about 40 crops - primarily food crops but also covers some horticultural and other crops not covered by WBCIS. Since the crops covered under WBCIS are horticultural, the scheme is administered by the Horticultural Department, GoK. On the other hand, the implementation of PMFBY is largely in the hands of the DoA, GoK.

Further, a cursory examination of the policy-decision on division of crop coverage by PMFBY or WBCIS suggests that WBCIS generally covers crops for which yield estimation is difficult. But then it is not always true as it includes some crops for which yield can be measured. The WBCIS policy was revised in 2016, when PMFBY was launched and is now known as RWBCIS. Crops such as potato, previously covered under WBCIS, is now under PMFBY. However, the policy rationale for switching the coverage from WBCIS to PMFBY is not clearly laid down and needs to be explored further.

This report presents the contexts and findings of a process evaluation aimed at understanding the operation of the scheme as it exists in Karnataka. Unlike most other studies on crop insurance, which are either theoretical in nature or examine the impact of a certain scheme on farmers' lives, this field-based study employs qualitative and quantitative methods to understand the processes of the scheme through the experiences and roles of various stakeholders. It attempts to provide an overview of how the scheme functions, the challenges, the evolution that has taken place in responding to these challenges and also the experiences of various stakeholders, especially farmers, who are the primary beneficiaries of the scheme.

The overarching research questions that the study attempts to answer are the following

a. What are the vulnerabilities faced by farmers and the need and rationale for crop insurance?
b. How does the PMFBY function? What are the operational processes? what are the design and operational needs of this scheme in particular?
c. What is the socio-demographic profile of enrolled farmers vis-à-vis non- enrolled farmers?
d. What are the farmers' expectations from and experience of PMFBY and other crop insurance schemes?
e. What is the budget allocation made towards this scheme? What does it reveal in terms of the budgetary priorities of the state?

2 Context

Karnataka state is situated in the west central part of peninsular India between 11^0 31' and 18^0 45' north latitudes and $74^0$12' and $78^0$40' east longitudes. It has a geographical area of 191791 sq kms which is about six per cent of the area of the country. The state has 30 districts and 176 taluks (blocks/sub-district level) (Annexure Figure 13.1).

Table 2.1: Comparison of India and Karnataka

Description	Karnataka	India
Area (lakhs sq km)	1.92	32.87
Population (2011 census)	61,095,000	1,210,570,000
Rural population (%) (2011 census)	61.3	68.8
Literacy rate (%) (2011 census)	75.4	73.0
Cultivators (%) (2011 census)	23.6	24.6
Agricultural labourers (%) (2011 census)	25.70	30.00
Gross irrigated area as % of gross cropped area	34.11	47.62
Per-capita income 2016-17 per annum (constant prices) in INR.	1,22,306	82,112

Source: Economic Survey of Karnataka 2016-17

Note: Cultivators and Agricultural labourers are calculated as a percentage of total workers.

2.1 Area and Land Holdings

Of the total geographical area of 19.05 million hectares, 16% is under forest, 14% is the land not available for cultivation (which includes land for non-agriculture usage, barren and uncultivable land and cultivable waste), six per cent is under permanent pastures and tree crops. Of the remaining 64% of geographical area, about 10.1 million hectares is under cultivation and 2.06 million hectares is under fallow land as of 2010-2011. Majority are small and marginal farmers (76%) who operate around 40% of the total cultivable area. The average size of the holding has reduced from 3.20 hectares during 1970-71 to 1.55 hectares during 2010-11(Annexure Table 13.5).The gross cropped area was around 12.2 million hectares and the cropping intensity was 122.47% during 2014-15.

2.2 Rainfall and Irrigation

Karnataka is highly dependent on the south-west monsoon for agriculture as only 34 percent of the gross cropped area is irrigated. As mentioned earlier, the state is divided into 10 agro-climatic zones based on rainfall. A significant proportion of area lies in a dry zone, with a rainfall range of 450 mm to 890 mm. The northern dry zone covers the largest cultivable area (25%) followed by the hilly zone (13%), the central dry zone (10%), the eastern dry zone (9%) and the southern dry zone (9%) (Annexure Figure 13.2). The annual average rainfall has been experiencing a declining trend. The long-term annual average rainfall declined from 1399 mm during 1901 to 1970 to 1217 mm for the period 1941-1990 and to 1147 mm for the period 1961-2010. In the recent past, the rainfall has been more erratic (deviation from the normal) in northern interior Karnataka than in other regions (Table 2.2) and more than 70 percent of taluks were declared as drought-affected since 2011 (with the exception of 2014-15 - Table 2.3). The deviation in rainfall recorded in the four prominent regions of the state is presented in Annexure Figure 13.3.

Table 2.2: Monsoon trends over the last five years in Karnataka

Region/State	Normal (mm)	2011		2012		2013		2014		2015	
		Act (in mm)	% Dev	Act (in mm)	% Dev	Act (in mm)	% Dev	Act (in mm)	% Dev	Act (in mm)	% Dev
SIK[2]	719	653	-9	538	-25	675	-6	752	5	922	28
NIK[3]	728	594	-18	519	-29	723	-1	741	2	520	-29
Malnad[4]	1914	1820	-5	1453	-24	2112	10	1989	4	1620	-15
Coastal[5]	3451	3464	0	2726	-21	3612	5	3322	-4	2713	-21
State	1155	1061	-8	869	-25	1182	2	1168	1	1008	-13

Source: KSNMDC Annual Report 2015. SIK: South Interior Karnataka, NIK: North Interior Karnataka

Note: Act represents the Actual Rainfall (in mm) and % Dev represents the deviation from the normal rainfall (in percent - rounded to zero decimals)

Table 2.3: Number of taluks declared as drought-affected out of the total 176 taluks in Karnataka

No of taluks declared as drought-affected	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
	123	157	125	35	137	139

Source: Economic Survey of Karnataka 2016-17

Note: GoK declares the sub-districts/taluks as drought-affected only if the rainfall deficit is greater than 19 percent of the normal monsoon.

Karnataka has invested around INR 900 billion during the last decade and a half for utilising the available irrigation potential under the Krishna, Cauvery and Tungabhadra river basins. The gross irrigated area as a percent of gross cropped area has increased from 16% in 1981 to 34% during 2014-15. The gross irrigated area increased from 1.7 million hectares to 4.2 million hectares during the same period. Canal irrigation accounts for about 33 percent of the irrigated area while the tube/bore well irrigation accounts for about 40 percent of the irrigated area. Wells, tanks and other sources constitute the remaining 27 percent (Annexure: Tables 13.7 and 13.8).

2.3 Crops and cropping patterns

Paddy, *jowar* (sorghum), maize and *ragi* (finger millets) are the important cereal crops grown in the state. While the acreage of *bajra* (pearl millets) and minor millets has been decreasing, the area under maize has increased over the years. The acreage of cereals which was 6.27 million ha during 1960-61 has reduced to 5.42 million ha during 1990-91and then to4.48million ha during 2014-15. Minor millets have paved way for coarse cereals and the diversity among the cereal crops has reduced (Annexure: Table 13.9). Similar trends exist for pulses as well. The area under pulses has increased from 1.31 million ha to 3.04

[2]South Interior Karnataka districts include Bengaluru Rural, Bengaluru Urban, Chamarajanagara, Chikkaballapura, Chitradurga, Kolar, Mandya, Ramanagara, Tumakuru, Davanagere and Mysuru.

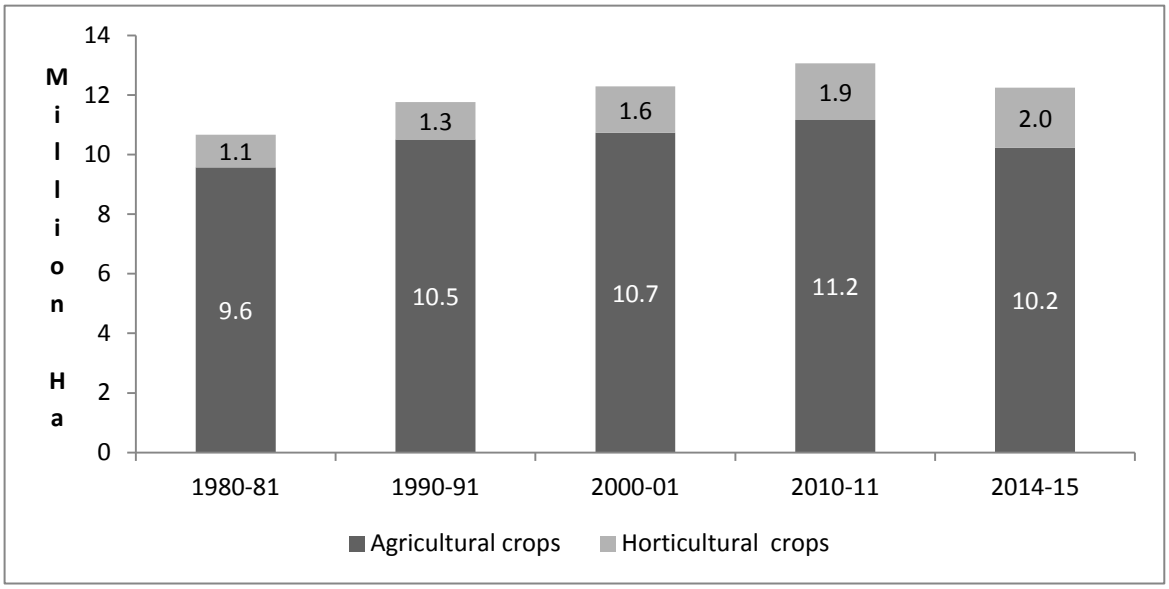
[3] North interior Karnataka districts include Ballari, Koppala, Bagalkote, Belagavi, Bidar, Dharwad, Gadag, Haveri, Kalaburagi, Raichur, Vijayapura and Yadgir.

[4]Malnad districts include Chikkamagaluru, Hassan Kodagu and Shivamogga.

[5]Coastal districts include Dakshina Kannada, Udupi and Uttara Kannada.

million ha during the period 1960-61 to 2014-15. The area under major pulses such as *tur* (red gram) and bengal gram has increased while that under horse gram, green gram, black gram and cow pea has decreased. Oil seeds acreage has been hovering around 1.3 million ha and growth has largely been due to greater area under soya bean while areas under other oilseeds have seen reductions in acreage. Commercial crops such as cotton and sugarcane have experienced expansion. Of the horticultural crops, fruit and vegetables acreages have been on the rise while the acreages on plantation and spices have almost remained constant for the period 2010-11 to 2014-15. Overall, the acreage and diversity of the cereals has reduced and that under pulses have increased. The share of agricultural crops during the period has reduced while the share of horticultural crops has increased by approximately six percent (Figure 2.1).

Figure 2.1: Changes in the acreage of agricultural and horticultural crops in Karnataka



Source: Economic Survey of Karnataka 2016-17

2.4 Crop loans/seasonal agricultural operations loans (SAOL) and agricultural credit

The *Kisan* Credit Card (KCC), introduced in 1998-99, has been the main instrument for the disbursement of crop loans in the state. A total of 3.67 million KCCs have been issued with a credit limit of INR 291.54 million by the end of March 2016. Primary agricultural co-operative societies (PACS) have issued 60% of the KCCs while the commercial banks and regional rural banks together have issued the rest. In terms of credit, 34 percent of credit under KCC is through PACs while the rest is through commercial banks and RRBs (Economic Survey of Karnataka 2016-17). The cooperatives provides loans up to a ceiling of Rs 3,00,000 without charging any interest while commercial banks charge 3% interest per annum (after an interest subvention of 3% by GoI and 1% by GoK for payment within due date) (Economic Survey of Karnataka 2016-17).

2.5 Risks and vulnerabilities

Studies by the Karnataka Agricultural Price Commission have indicated that about 2.1 million hectares (21% of the cultivable area) have been kept fallow in the last five years and nearly 61% of these lands belong to small and marginal farmers. Failure of monsoons and lower productivity are the prominent causes for the land being fallow. Studies also pointed out that

returns from the crops become negative for majority of crops if the costs of family labour and management costs are included (Various reports of Karnataka Agricultural Price Commission).

In the last decade, there has been an increased investment in irrigation as farmers have switched to cultivation of commercial crops from subsistence crops. This has resulted in cultivation of a single crop through different seasons (for example: cultivation of *jowar* during *Kharif* and *Rabi* continuously) which in turn has led to reduced availability of forage and fodder for livestock. The latest livestock census in 2012 indicates reductions in the population of cattle, buffaloes, goats and sheep as well as other livestock since 2007. Further, this practice has also impacted food security by way of lesser availability of millets and pulses. Increased access to irrigation, mechanisation and fertilisers have improved efficiency but also increased risks. In the event of crop failure, the farmers in irrigated areas are more vulnerable than others because of the higher investments by way of off-farm inputs used in the production process (like improved seeds, fertilisers, plant protection chemicals etc).

Rama Rao et al. (2016) assessed the vulnerability of agriculture due to climate change across the country at the district level using 38 indicators. The results show that the out of the 115 highly vulnerable districts with low adaptive capacities in the country, Karnataka has 14 districts. These districts are located in the dry zones of the state[6] (northern, eastern and southern). Karnataka is considered the second driest state in India after Rajasthan (Kalavakonda and Mahul, 2005), with more than seventy-five percent of arable land in rainfed regions.

2.6 Evolution of crop insurance in Karnataka

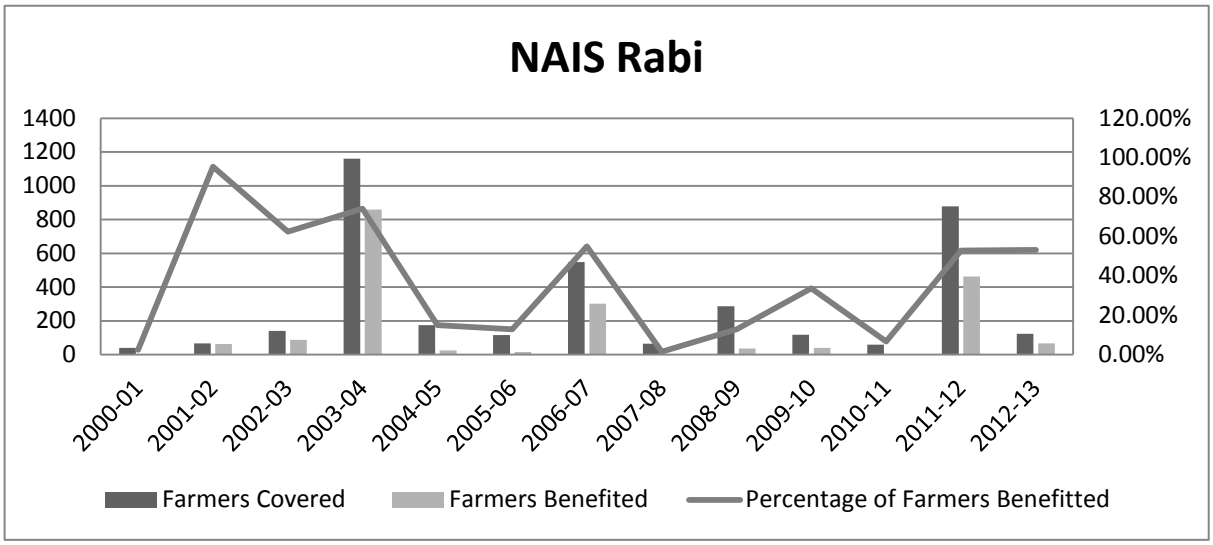
Karnataka has been implementing area and yield-based crop insurance schemes since the 1970s. The Comprehensive Crop Insurance Scheme (CCIS) was introduced in 1986. However, the claim reimbursement ratios have risen after the implementation of the NAIS in 2000. During the early years, crop insurance was not considered effective in smoothing fluctuations in income, as the optimal conditions to be met for the insurance to create measurable risk-benefits did not exist in the semi-arid tropics in India (Walker and Singh, 1986). This poses further problems for Karnataka with two thirds arid or semi-arid land, 18 out of 27 districts being drought-prone and the fact that even in good rainfall years, 25 percent of all taluks affected by uneven rainfall (Kalavakonda and Mahul, 2005). In general, the government was unable to settle claims for all the losses reported by farmers, especially in the *Kharif* season. Loss ratios have also been higher in the *Kharif* seasons (Kalavakonda and Mahul, 2005) (Annexure: Figure 13.4a and 13.4b).

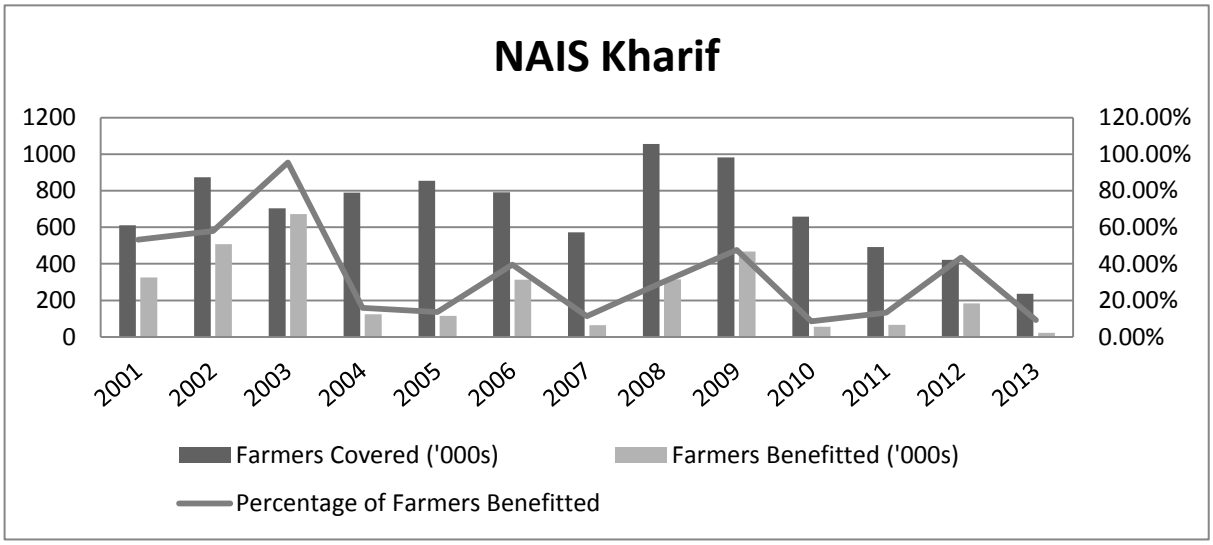
2.6.1. National Agriculture Insurance Scheme (NAIS)

The NAIS, introduced in 2000, was considered to be the world's largest area yield index insurance programme at that time (Rao, 2010). The major difference is the fact that NAIS provided greater coverage than the CCIS which had only included farmers who borrowed from financial institutions. A perusal of trends in both *Kharif* and *Rabi* seasons show very erratic trends of claims (Figures 2.2).

[6] Gulbarga,Raichur, Bijapur,Koppal, Ballari, Gadag, Bagalkot, Chitradurga, Tumkuru,Kolar,Chickballpur, and Bangalore rural districts.

Figure 2.2: NAIS coverage between *Kharif* and *Rabi* in Karnataka





Source: NSSO 59th Round

Note: The two y-axes show cases two different measures, the left-hand axis represents the number of farmers (000s) covered and who benefitted from NAIS, while the right axis represents the percentage of farmers that benefitted through the insurance.

What emerges from the analysis of this data is that in certain drought years, the NAIS did benefit a higher percentage of enrolled farmers, especially in 2003. However, the trends are not consistent and *Rabi* coverage especially has been fluctuating from one year to another. It also seemed surprising that certain years of heavy drought did not show a high number of farmer coverage and claims ratios (2011, 2012 and 2013 for the *Kharif* seasons, and 2001 and 2002 in *Rabi* seasons). Overall, the uptake was low with only six percent of farmers in Karnataka having ensured their crops as against 12 percent of farmers at the national level.It is a matter of concern for Karnataka that lesser number of small or marginal farmers have been willing to use the crop insurance (Kalavakonda and Mahul, 2005). Even among the large farmers, only four percent of large farmers had their crops insured in Karnataka, which is much lower than 12 percent observed at the national level (Table 2.4).

Table 2.4: Distribution of farmers who had enrolled for crop insurance by land ownership category

Type of farmer	% of farmers that insured their crops (India)	% of farmers that insured their crops (Karnataka)
Small and Marginal	10	5
Medium	18	10
Large	22	4
Total	**12**	**6**

Source: NSSO 59th Round

2.6.2 Weather Based Crop Insurance Scheme (WBCIS)

In 2005, the GoI implemented *Varsha Bima* (Rainfall Insurance) using rainfall deficits for the prediction of shortfalls in crop yields, based on notified crops (Singh, 2010). Using rainfall indicators, the scheme estimates variability in crop yields. This is also more flexible in terms of timelines and also allowed for faster settlement of claims (Singh, 2010). It is also the first insurance scheme that allowed for private insurance companies to compete with the Agricultural Insurance Company (AIC)[7] in offering subsidized products. However, the largest problem facing WBCIS[8] is the large level of basis risk due to the areas on which the weather indicators are based and infrastructural issues such as weather stations which could only predict rain loss in the areas in which it operates. This meant that if smaller patches of land are affected by hailstorms or sudden rainfall patterns, it would not be able to avail the compensation if the rest of the area showcased different weather patterns (Clarke et al, 2012).

2.6.3 Modified National Agricultural Insurance Scheme (MNAIS)

The government modified NAIS so as to increase access to farmers and provide claims taking localised risks into account by making the IU smaller than that of NAIS. The scheme began from the *Rabi* season of 2010-2011.The uptake of the scheme was much higher in *Kharif* seasons than in *Rabi* seasons. This might be a response to the fact that most farmers in the state are more dependent on the *Kharif* crop for their major agricultural output in the year due to better weather conditions. Even with this, large parts of the state have seen drought during the period of its functioning (2011, 2012, 2013) with 24, 26 and 22 districts reporting droughts respectively (GoI, 2016) (Annexure Figure 13.5).

[7]The AIC was formed in the financial year 2002-03 for the improvement of farmers' needs in the insurance process. It began taking over from its predecessor GIC post-CCIS and took over the NAIS from 2002-03. It has a more focussed approach towards crop insurance schemes.
[8]It was implemented in Karnataka in 2006.

3. Intervention description and the theory of change

The PMFBY scheme was launched by the GoI on January 13, 2016 and was subsequently implemented in the *Kharif* season of 2016. The PMFBY scheme has replaced the NIAS and MNIAS schemes and currently operates along with the WBCIS scheme[9]but one does not cover crops covered by the other. The intervention is similar to NAIS in that it is a national, multiple-peril insurance programme following a mixture of area and individual approaches. The main objectives of this programme as stated in the guidelines[10] are:

- providing financial support to farmers suffering crop loss/damage arising out of unforeseen events
- stabilising the income of farmers to ensure their continuance in farming
- encouraging farmers to adopt innovative and modern agricultural practices
- ensuring flow of credit to the agriculture sector which will contribute to food security, crop diversification and enhancing growth and competitiveness of the agricultural sector besides protecting farmers from production risks.

There has been an increase in the number of farmers enrolled and areas for both seasons (Table 3.1). First, there has been almost a 40% increase in the number of farmers enrolled between the 2 successive *Kharif* seasons under PMFBY (2016-17 and 2017-18). This increase could have been driven by the prevailing drought conditions especially in North Karnataka. The drought-like situation may have prompted non-loanee farmers to opt for insurance in *Kharif* 2017-18. Second, there is a fourfold increase in farmer's enrolment in *Rabi* 2016-17 (PMFBY scheme) when compared with the previous *Rabi* season in 2015-16 (NAIS scheme). This is largely because of the PMFBY scheme bringing in additional crops and areas within the insurance coverage. The higher enrolment in the *Rabi* season in 2016-17, relative to the *Kharif* 2016-17, could be due to the increased level of enrolment drives undertaken by the DoA to ensure that the farmers enrol, especially after the hardships faced because of demonetisation. The DoA and local officials collected application forms, submitted them and extended the cut-off date to ensure that farmers are included under the scheme. It would be interesting to observe whether a similar pattern emerges for the period 2017-18 as well.

[9]In Karnataka state, food grains such as paddy, *jowar* and maize are covered under PMFBY whereas horticultural / plantation crops such as grapes, pomegranate, arecanut and pepper are covered under WBCIS.
[10]http://agri-insurance.gov.in/Pmfby.aspx

Table 3.1: Enrolment in crop insurance across last three seasons (2015-16, 2016-17 and 2017-18), Karnataka state

Year /Scheme	Farmers enrolled (000')	Loanee farmers (000')	Non-loanee farmers (000')	Insured crop area coverage (in million hectares)	Total amount insured INR million	% of crop sown area insured*
Kharif season						
2017-18/	1333	572	761	1.80	82210	26.00
2016-17/	944	744	200	1.20	56090	17.40
2015-16	872	380	492	1.23	30000	17.80
Rabi season						
2016-17 /	1168	146	1022	1.68	43030	55.30
2015-16	322	23	299	0.49	6580	16.30

Source: *Samarakshane* Crop Insurance Portal and Profile of Agriculture Statistics, 2015

Note: The percentage of crop sown area insured is derived by dividing the insured crop area coverage with the total crop sown area. (2010-15 average total crop sown area for *Kharif* is 6.92 million hectares and *Rabi* is 3.03 million hectares)

The entire implementation of the scheme can be broken up into three stages: pre-notification and notification, enrolment and claims. The key design features of the PMFBY scheme based on the PMFBY Operational Guidelines, GoI, Ministry of Agriculture and Farmer's Welfare, 2016, at the various stages are as follows:

3.1 Pre- Notification and Notification

PMFBY covers crops grown across *Kharif*, *Rabi* and summer seasons. The coverage includes food crops (cereals, millets and pulses), oil seeds as well as annual commercial and horticultural crops. The scheme can potentially cover any crop for which past yield data is available, grown during the notified season in a notified area and for which the yield estimation based on the required number of CCEs at the notified area level is available. In Karnataka, a large number of crops have been covered under this scheme. During the *Kharif* season of 2016, 40 crops were notified, which was the highest in the country.

PMFBY employs a mixture of an area approach basis and individual approach for the assessment of crop damage. An area or unit of insurance is a geographical region in which farmers are assumed to face similar risks. The unit of insurance is a gram panchayat for major crops and a *hobli* (cluster of gram panchayats) for minor crops. The unit of insurance decided by the government for a crop during a season is referred to as notified area. In order to diversify the risk and cover high/medium/low risk district areas equally, the government clusters the districts in such a way that each cluster contains a mix of districts with different risk profiles. The clusters are not necessarily geographically contiguous.

The government calls for bids from empanelled insurance companies (both public and private) for pre-defined clusters. For each cluster, the insurance companies are required to quote actuarial premium rates for all district-crop combinations. Then, the company with the

lowest actuarial rates of premium wins the bid for that cluster. The L1 bidder is then selected to act as the 'implementing insurance agency' for that particular cluster. For the *Kharif* season of 2017, along with the public sector company - AIC, 15 private insurance companies were invited for bids.

Once the bidding process is completed with the identification of L1 bidder, the notification of IU-wise crops is issued by the DoA, GoK to enable enrolment. The cut-off dates and the premium payable by the farmer for each of the notified crops are mentioned in the notification. District and taluk-level offices issue similar notifications providing the details of IU-wise crops along with the cut-off dates, invoking dates of prevented sowing and the premium payable by farmer per acre. Simultaneously, the Directorate of Economics and Statistics (DES), plans for the CCEs to be conducted for all the crops across different IUs.

3.2 Enrolment of farmers

Once the areas and crops have been notified, the process of enrolment begins. The farmers usually enrol through banks or PACS. All farmers growing notified crops in notified areas during the respective seasons are eligible. For farmers availing SAOLs from financial institutions (known as loanee farmers), the insurance coverage is compulsory for notified crops whereas the scheme is optional for non-loanee farmers. The feature is similar to previous insurance schemes such as the NIAS and MNIAS. Sharecroppers or farmers who cultivate others' lands are not covered under PMFBY, as the scheme requires submission of Record of Rights, Tenancy and Crops (RTC) in the farmers' name to be eligible for insurance coverage and subsequently claim settlements. The bank or insurance official has to enter all the information pertaining to the loanee/non-loanee farmer enrolled with PMFBY on the crop insurance portal *Samarakshne.*

The farmers pay a premium rate based on the sum insured which is decided based on the scale of finance[11]for each crop. The estimation of scale of finance is provided in Annexure Note 12.1. The sum insured for an individual farmer is equal to the scale of finance multiplied by area of the notified crop proposed by the farmer for insurance. Under this scheme, the sum insured per hectare is the same for both loanee and non-loanee farmers. The Actuarial Premium Rate (APR) is charged by the implementing agency. However, the maximum insurance charges payable by farmers are as follows:

- 2.0% of sum insured or APR whichever is less for *Kharif* season and applied to all food grain and oilseed crops (all cereals, millets, pulses and oilseed crops)
- 1.5 % of sum insured or APR whichever is less for *Rabi* season and applied to all food grain and oilseed crops (all cereals, millets, pulses and oilseed crops)
- 5% of sum insured or APR whichever is less for *Kharif* and *Rabi* season and applied to annual commercial/ annual horticultural crops.

The difference between the APR and the premium rate payable by farmer as defined above is treated as rate of normal premium subsidy and is shared equally between the GoI and respective state governments.

[11]Scale of finance is the finance required for raising a crop per unit cultivated area, i.e. acre or hectare

3.3 Claims and processes of assessing crop damage

PMFBY covers four types of risks during various stages of the crop cycle:

I. Prevented sowing/ planting risk: no sowing/planting has taken place in the insured unit due to deficit rainfall or adverse seasonal conditions
II. Standing crop (sowing to harvesting): Comprehensive risk insurance is provided to cover yield losses due to a variety of both weather and other, non-preventable, risks: drought, dry spells, flood, inundation, landslides, natural fire and lightening, storm, hailstorm, cyclone, typhoon, tempest, hurricane and tornado, and pests and diseases
III. Post-harvest losses: Coverage is available only up to a maximum period of two weeks from harvesting, against specific weather perils of cyclone, cyclonic rains and unseasonal rains. Coverage is only available for crops allowed to dry in what is known as cut-and-spread conditions in the field after harvesting
IV. Localised calamities: Loss/damage resulting from identified localised risks of hailstorm, landslide, and inundation affecting isolated farms in the notified area.

An area approach is employed to assess the first two forms of risks whereas an individual approach is employed to assess post-harvest losses and localised calamities. However, certain types of risks are not covered namely war, nuclear risks, malicious damage and other preventable risks. The threshold yield (TY) or benchmark yield level, is the average yield of the last seven years, excluding two years of declared calamity, if any, multiplied by the level of indemnity for that notified crop. The threshold yield in previous schemes such as the NAIS and MNAIS was based on averages for a shorter period of five years. In Karnataka, only 80 and 90 percent indemnity levels are applicable for rainfed and irrigated crops respectively. (Government of Karnataka 28/02/2017). In the case of losses due to mid-season adversities, claims are based on an index which measures the difference between the threshold yield and the actual yield. The DES conducts the requisite number of CCEs for all notified crops in all notified IUs in order to assess the actual crop yield for that season.

Table 3.2: Number of CCEs to be conducted at different levels

Serial No	Unit of Insurance	Minimum number of CCEs required
1	District	24
2	Taluk / Tehsil / Block	16
3	Mandal/Hobli/Phirka/Revenue Circle	10
4	Village / Gram Panchayat	4 for major crops, 8 for minor crops

Source: PMFBY guidelines

An area approach is used to assess losses due to prevented sowing. More than 75% of the notified IU should be unsown for individuals enrolled to be eligible for insurance. An individual in a prevented sowing IU can receive up to 25% of the sum insured, post which insurance cover is terminated. In case of adverse seasonal conditions during crop season, the state government based on meteorological data or satellite imagery or any other proxy indicators would decide on notified crops/areas which are eligible for a payment. The DoA and DES regularly monitor the sowing coverage to estimate all crop-related statistics such as area coverage, crop-wise sown area, production, and others. This data is corroborated with the data from the Metrological Department to identify the IUs for which prevented sowing can be invoked. Since the data from DoA and DES is used for official crop area

estimation, the insurance companies do not necessarily contest the base statistics used to determine payout for the prevented sowing cases.

Further, the payments made cannot exceed 25% of the likely claims. The argument is that farmers incur costs of land preparation, seeds and initial dose of fertiliser application which may be in the range of 20-40% of the costs depending upon the moisture level in the soil (rainfall/irrigation). While the payout of 25% of sum insured may not be realistic, given that farmers would go for some other short-duration crop in the same field (with additional tillage activity), this may not be very far from reality.

Comprehensive risk insurance is provided to cover yield losses. If the actual yield (AY) per hectare of insured crop for the IU (calculated on basis of requisite number of CCEs) in an insured season falls short of the specified threshold yield (TY), all insured farmers growing that crop in the defined area are deemed to have suffered shortfall and the claims payout is calculated as per the following formula:

$$Claim\ Payout = [(Threshold\ Yield - Actual\ Yield) * (Sum\ Insured)]/[Threshold\ Yield]$$

Post-harvest losses and localised risks on an individual farm basis is applicable only if the farmer informs the insurance company/concerned bank/local agricultural department/district officials within 48 hours after the insured peril has occurred. When the affected area is limited up to 25% of the total insured area, the losses of eligible farmers are assessed on an individual farm basis by loss assessors appointed by the insurance company.The appointment of loss assessors should be within 48 hours from receipt of information and the loss assessment is to be completed within the next ten days. On the other hand, when the affected area under a notified crop is more than 25% of the total insured area, all enrolled farmers are eligible for claim settlements. In both cases, the loss is jointly assessed by a team comprising of a loss assessor appointed by the insurance company, a block level agriculture officer and the concerned farmer.

The percentage of post-harvest loss is estimated by the insurance company conducting a sample survey of the affected area. Subsequently, if the claim related to shortfall in yield (based on CCEs) is more than the claims of post-harvest losses, only the difference in claims would be payable to affected farmers.

Use of technology for better estimation of crop yields

Mobile phone technology has been used to record and upload CCE data. This is one of the important innovations of this scheme. An android-based mobile application has been developed for recording and transmitting CCE data using smart phones. This allows for improved data quality (geo-tagging, time stamping, photos and videos), immediate data transfer to the central crop insurance portal and hence availability of real time CCE data to both government officials and insurance companies. The geo-tagging/recording of plot coordinates ensures that the plot chosen for conducting the CCE by the primary worker matches with DES's CCE plan. The mobile application has been designed in such a way that it works in both online and offline modes. The data transmitted by the smart phone includes crop area, probable harvest date, net weight of the produce obtained, photos and videos of whole field / selected plot, harvesting and weighing of wet yield.[12]

This information, when transmitted to a centralised server, is expected to lead to faster compilation of data and quicker verification and settlement of claims. There is also an

[12]Detailed methodology is available at - http://des.kar.nic.in/ (crop insurance scheme/CCE Methodology)

increased emphasis on the need for adoption of innovative technologies such as remote sensing technology (RST), drones and geographic information system (GIS). It has been reasonably proven that satellite imagery can help in demarcating the cropped areas into clusters on the basis of crop health in areas with low cloud cover and other similar impediments. The Mahalanobis National Crop Forecast Centre (MNCFC) is currently working on the KISAN project[13]. The objective of this research project was to use high resolution remote sensing imagery for planning of CCEs and improving yield estimation, especially for a few long-standing crops (such as paddy, *jowar* and cotton) and in selected areas/districts with low cloud cover. A study from MNCFC reported successful use of remote sensing-based crop stratification in selection of the CCE plots for rice grown in the *Kharif* season in Seoni district, Madhya Pradesh. One of the findings from this study was a high correlation between remote sensing-based indices and yield values at the block level.[14] Similarly, district-level yield estimation models using remote sensing-based indices have also been developed for sugarcane and cotton[15].

PMFBY also favours an increased applicability of information and communications technology (ICT) tools for farmer enrolment, database management of historical crop yield and integration with land records, loss assessment and claims settlements. According to the guidelines, the emphasis on ICT is to make these mechanisms more efficient, transparent and farmer-friendly. These, in turn, could improve the trust in the insurance product, thereby increasing its demand from farmers.

Having said that, the use of technology also led to certain issues such as (i) primary workers choosing the "single-picking" option in the CCE mobile app for a multi-picking crop which resulted in insurance companies contesting the CCE data; (ii) Primary workers erroneously entering incorrect plot size option-for example a 10*5 plot was chosen instead of 5*5 for crops such as cotton, castor, sunflower and tur; and (iii) lack of a standard protocol requiring insurance companies to authenticate the CCE data within a fixed time period which resulted in insurance companies contesting the CCE data at the time of claims settlement. Lack of appropriate training and procedural challenges led to CCEs being contested by insurance companies and subsequent delays in disbursement of claims.

[13]Crop Insurance using Space technology and geo informatics - http://www.ncfc.gov.in/kisan.html
[14] http://www.ncfc.gov.in/download.html – Use of remote sensing for CCE Planning by Sunil Kumar Dubey
[15]http://www.ncfc.gov.in/download.html – Role of Technology in PMFBY by Shibhendu S Ray

Institutions and stakeholders

Figure 3.1 provides a snapshot of stakeholders at various levels and Table 3.3 provides the details of their responsibilities.

Figure 3.1: Institutions and Stakeholders

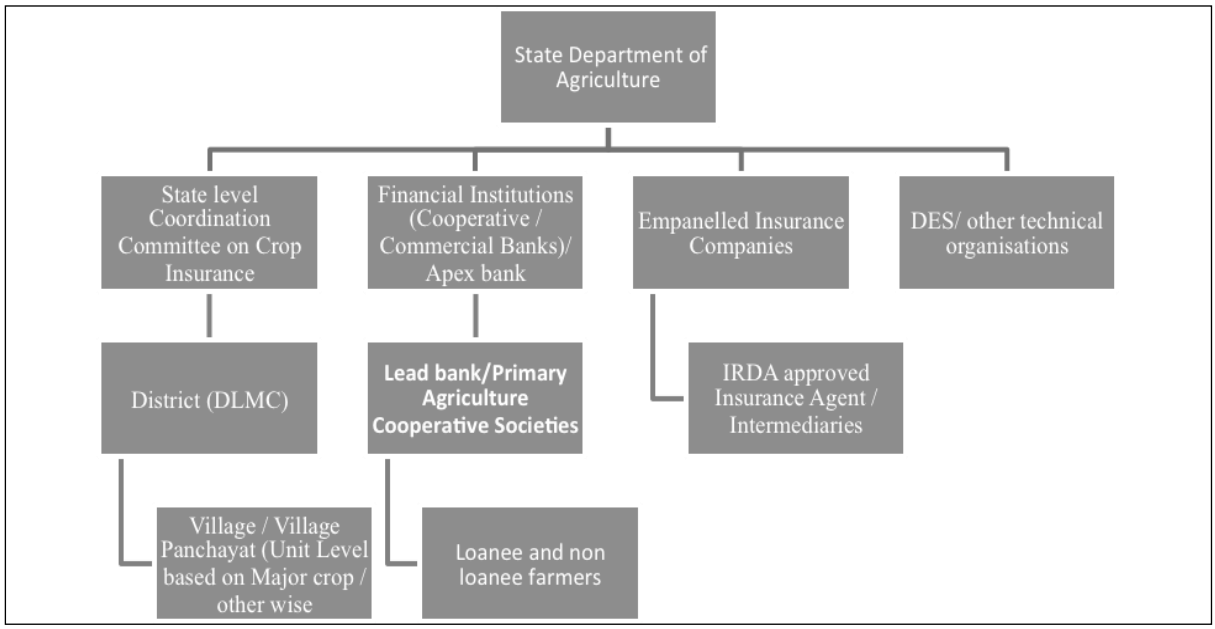


Table 3.3: Roles and responsibilities of key stake holders

Stakeholders / Phases	Department of Agriculture	Directorate of Economics and Statistics (DES)	Insurance Companies	Banks/Primary Agricultural Cooperative Societies (PACS)
Pre-Notification	1. Acts as Secretariat to the SLCCCI 2. Finalising the calendar for implementation of PMFBY 3. Formation of clusters (based on risk levels and coverage) 4. Identification of IUs across the state for different crops and seasons 5. Finalising the crop-wise indemnity levels and sum insured 6. Estimation of targets for crop-wise coverage across seasons 7. Tendering process - invitation of bids, evaluation of bids, finalising important clauses (term sheets) and selection of insurance agencies across different clusters	1. Finalisation of crop wise acreage estimates (enumeration) across IUs – for previous year and sharing it with DoA	1. Submitting bids(actuarial premiums for different crops/clusters) 2. Negotiation of term sheets/clauses relating to implementation of PMFBY	1. The District Central co-operative banks provide the scale of finance for different crops based on the advice of DLTC[16] which is in turn used to arrive at sum insured (and premium) for different crops
Notification	1. Issuing of notification containing IU-wise crops, indemnity levels, actuarial premium rates, sum insured, premium to be paid by farmers and the cut off dates for enrolment 2. Instructions to DLMC for publicity and facilitation of enrolment 3. Ensure the uploading of notification details on to the *Samrakshane* portal	1. Prepare plan for conducting CCEs 2. Finalisation and training of primary workers and supervisors	1. Plan to witness the CCEs	

[16] District Level Technical Committees (DLTCs) comprise DCC bank officials, experts from agricultural department and universities and farmer representatives who decide on the scale of finance for different crops in the district.

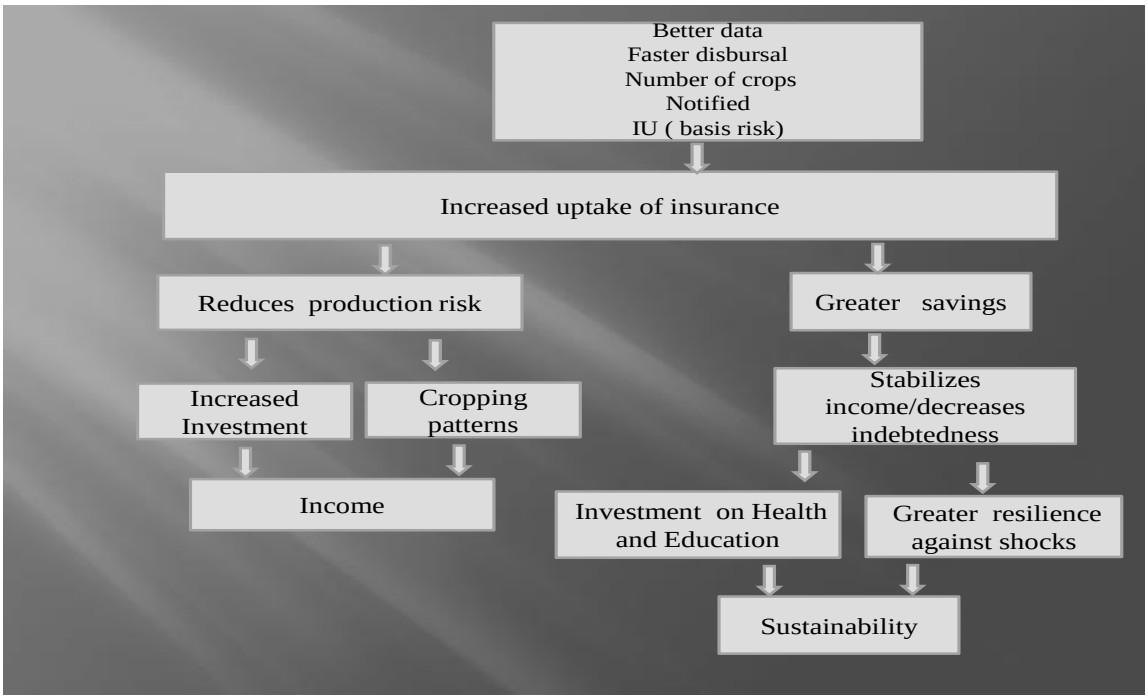
Stakeholders → / Phases ↓	Department of Agriculture	Directorate of Economics and Statistics (DES)	Insurance Companies	Banks/Primary Agricultural Cooperative Societies (PACS)
Enrollment	1. Publicity campaign (banners, pamphlets, announcements etc) 2. Monitoring of enrolment through SLCCCI and DLMC 3. To invoke the prevented sowing notification based on proxy indicators from KSNDMC		1. Distribution of application forms for facilitating enrolment	1. Facilitate enrolment[17] through registration on the *Samrakshane* portal. 2. Maintain hard copies of the application 3. Verify application-related documents
Claims (post enrolment phase)	1. To invoke the prevented sowing notification based on proxy indicators from KSNDMC 2. Generate IU-wise , crop-wise shortfall in yield based on CCE data 3. Initiate claims payable based on shortfall in yield and share it with insurance companies for further processing of claims 4. Mediating claims/CCE related disputes and resolving the same (through SLCCCI) 5. Monitoring the claims settlement and reporting to government	1. Conduct the CCEs as planned 2. Enumeration and reconciliation of crop wise sown area statistics 3. Sharing results of 1&2 with Dept of Agriculture 4. Provide additional data on CCEs / sown area to support resolution of claims disputes 5. Overseeing the Insured Crop Verification (ICV) exercise in case of insured area for a notified crop exceeding the estimated crop sown area.	1. Acknowledge the applications/insurance proposals received by banks/other sources along with the receipt of premium paid by the farmers 2. Witness CCEs and contest the same in case of discrepancies being observed. 3. Verify the claims payable and settle the claims (directly to the farmer)	1. Intervene in case of discrepancies related to bank accounts and online transfers (if needed)

[17] In few places, GPs were also involved in enrolment. From 2017-18, citizen service centers are also entrusted to serve as enrolment centers.

3.4 The Theory of change

The theory of change as envisioned by the programme is similar to that of any crop insurance programme targeted at small and marginal farmers. The goal is to ensure sustainable livelihoods and lives for individual farmers and also the agricultural sector as a whole. Any crop insurance scheme tries to mitigate the uncertainty faced by farmers. The immediate outcomes of a decrease in uncertainty are a decrease in production risk, increase in greater savings and increased efficiency in the estimation of yields. On the financial side, greater savings are said to lead to moving away from informal sources of credit, greater financial inclusion and hence income stability and a decrease in indebtedness. This in turn should lead to higher investments in education and health and a higher resilience against shocks. On the production side, the decrease in production risk is assumed to lead to an increased investment in agriculture and more sustainable cropping patterns. The final outcomes should be a decrease in agricultural distress, increased competiveness and sustained growth of the agricultural sector.

Figure 3.2 Theory of Change



Source: Adapted from The effectiveness of index-based micro-insurance in helping smallholders manage weather related risks, Cole et al. 2012

The PMFBY attempts to increase insurance uptake among farmers by decreasing the cost of insurance by capping the premium rate. Technology is being employed for faster and better estimation of yields. Online enrolment attempts to integrate data on farmers enrolled and land records, and also provide greater accessibility. Previously, it was possible to enrol the same plot of land for insurance at different PAC's or banks. Financial institutions could not check whether a plot of land had been previously insured. The integration of land records and information under one portal (*Samarakshne*) has enabled prevention of the same farmer with the same RTC enrolling more than once. This has reduced the problem of duplicity of enrolment where the insurer could not identify if a plot/land was already insured or not.

Faster and greater accuracy of the estimation of yields should hasten the disbursal of funds; this in turn should stabilise farmers' income. We postulate that stabilising farmers' income has intergenerational impacts. For example: farmers in Haliyal (one of the four taluks studied) suggested that crop failures often lead to family migration to urban areas, which could result in the discontinuation of their children's education (Deshingkar and Akter, 2009; and Dyer, 2012), often even leading to their engagement in child labour.

4 Monitoring plan

The PMFBY process was broken up into different stages, as mentioned before. The likely outcomes for each stage and methods employed to understand those are illustrated below.

Figure 4.1: Methods used to understand the different stages of PMFBY

Notification and Pre-notification	Enrolment	Post-Enrolment Claims
Outcomes examined • Budget outlay, Policy (Budget data, GoK, SLCCCI guidelines) • Implementation fidelity (Guidelines PMFBY- Participant observation) • Crops notified and clusters formed, • (GOK notifications, *Samrakshane* website) (SSI) • Problems and resolution of these in previous seasons (Participant observation) (SSI)	**Outcomes examined** • Awareness drives (SSI, Participant Observation) • Enrolment across districts *(Samraskhane)* • Problems faced in the implementation (SSI, Participant observation)	**Outcomes examined** • Actual experience of different stakeholders (SSI) • Estimations of yields Basis risks (GOK information) • Speed of claims disbursed (FGD, Survey of farmers) • Problems faced • in the implementation(SSI)claims ratio (GoK document review)

The sources of information used to examine respective outcomes have been mentioned next to the outcome of interest at each stage of the process. It is clear that the use of multiple methods has helped in covering feedback from diverse stakeholders.

Outcomes and the theory of change:

- budget outlay, policy (Budget data GoK, SLCCCI guidelines)- sustainability of the intervention and overall likely impact on the agricultural sector
- implementation fidelity (PMFBY guidelines, Participant observation) - likely impact on the uptake of insurance
- crops notified and clusters formed- risks covered- potential for stabilising incomes
- problems and resolution of these in previous seasons (Participant observation) (SSI) - sustainably of the intervention

Awareness drives (SSI, Participant Observation)

- Enrolment across districts (*Samrakshane*)- Number of people impacted, patterns across the state, risk profiles across the states
- Problems faced in the implementation - data requirements - potential for the programme (SSI, Participant observation)

Post-enrolment claims

- Actual experience of different stakeholders (SSI) - ease in implementation - perceptions of trust and impact on farmers lives
- Yield estimation
- Basis risks (GOK information)
- Speed of claims disbursed (FGDs, Farmer surveys)
- Problems faced in the implementation (SSI) and claims ratio (GoK document review)

5 Evaluation Questions

This report presents the findings of the process evaluation of the PMFBY implemented in Karnataka. Our primary objective was to understand the role and responsibilities of stakeholders, processes of implementation and challenges faced uptake of insurance, farmers' experience of PMFBY and the ability of the scheme to reduce vulnerabilities associated with crop loss. The primary questions examined were as follows:

a. What are the design, rationale and operational details of this particular scheme?

b. What are the roles and responsibilities of different stakeholders, including government officials, banks and other financial agencies such as the insurance companies?

c. What are the profiles of enrolled and non-enrolled farmers (profiles of farmers covered in terms of socio-demographic and other household characteristics; size of holdings, household income, dependence on agriculture as livelihood, previous use and experience of agricultural/crop insurance)?

d. What are farmer perceptions regarding the need for crop insurance, their expectations and experiences of this programme?

e. What are the implementation challenges and how different are these compared to previous insurance schemes?

f. In what ways might the design and operational barriers be addressed to enhance the uptake of the scheme by the most vulnerable? Has the scheme helped in enhancing the security and reducing vulnerabilities associated with crop failure?

g. What is the size of public expenditure for this scheme and how different it is from earlier schemes? How does it relate to the total public expenditure on agriculture and how has it impacted the budget for agriculture in Karnataka?

6. Evaluation design and data

A mixed method approach was undertaken for a comprehensive evaluation of the PMFBY scheme. The scheme involves several stakeholders with varying levels of roles and responsibilities. To understand the processes at the state, district and local administrative levels, we adopted qualitative methods such as participant observation and semi-structured interviews with key stakeholders. To undertake participant observation, a researcher was assigned to work at the DoA, GoK, to focus on understanding the implementation process, negotiation of rules (or guidelines) provided in the scheme, interactions with different stakeholders and the processes adopted to realise the actual objectives of the scheme. This also facilitated in developing stronger relationships with government officials at various levels. Next, we developed semi-structured interviews for officials from insurance companies, nodal banks (commercial or rural regional banks), officials from the DoA, the Horticulture Department and the SLCCCI to understand approaches/measures adopted and challenges faced in implementing the scheme.

To understand farmers' experiences, we undertook a primary survey in four taluks namely Haliyal, Sindhanur, Shirahatti and Naragund. In addition, we conducted focus group discussions (FGDs) with farmers to understand the experiences of crop loss and its consequences, risk management strategies, implementation processes, challenges faced during the entire process and perception of benefits derived from PMFBY. In each taluk, FGDs with a minimum of ten participants were conducted, translating to 16 FGDs in all. The following sub-sections provide details of the sampling frame, sampling strategy and weighting strategy adopted by us. Details of monitoring mechanisms adopted are provided under Annexure Note 12.2.

In addition, we used datasets such as *Samrakshane* containing enrolment and claim details, *Bhoomi* data containing details of land ownership, Agriculture Census (2011) to understand the distribution of farming households at the gram panchayat level and Status of Agricultural Farmer surveys from National Sample Survey Organization (NSSO) to understand the level of enrolment in previous schemes at the state and national levels.

6.1. Sample Selection

Sampling Frame

In this section, we begin by discussing the relevance of ensuring variation by season (*Kharif* / *Rabi*), choice of crops and water source (irrigation/rainfed) in cultivation to develop the sampling frame for our primary survey. In terms of season, the percentage of area cultivated and production in *Kharif* was about 60 and 70 per cent respectively for the year 2012-2013.[18] Our analysis indicated that maize, rice, *jowar* and gram were the top four crops in terms of area under production in Karnataka in 2013-2014 (Refer Annexure Table 13.10).[19] These crops are predominantly cultivated during the K*harif* season. Further, there is significant enrolment in PMFBY scheme in both *Kharif* and *Rabi* 2016 where 1.6 million and 1.7 million respectively

[18]Source: http://raitamitra.kar.nic.in/Karnataka%20State%20Profile%202013.pdf (accessed on May 20th 2017). Similar patterns were observed for 2010-2011 and 2011-2012 during which time period the area cultivated and production in *Kharif* accounted for 65 and 75 per cent (approximately) of the total area cultivated and production in Karnataka.

[19]Similar patterns were observed for the time period 2011-2012 and 2012-2013.

(Annexure Table 13.11). We decided to cover one *Kharif* season and one *Rabi* season for our primary survey to capture the variation in crops grown, risk exposure, expenditure, and crop insurance by season.

In terms of enrolment in PMFBY, paddy accounts for 18.09 per cent of total enrolled farmers during *Kharif* 2016; and *jowar* accounts for 43.46 per cent of total enrolled farmers during *Rabi* 2016 (Annexure Tables 13.12-13.14). Hence, we identified paddy and *jowar* crops for the *Kharif* and *Rabi* seasons respectively for our primary survey. Both these crops have high levels of enrolment in PMFBY in both irrigated and rainfed farms. But about 82 per cent of enrolled farmers belong to those dependent on rains and 13 per cent of enrolled farmers are dependent on irrigation.[20] Similar patterns are observable for insured areas. This is understandable as the probability of crop failure is expected to be higher for farmers dependent on rains, especially given the severe drought in recent years in Karnataka. On the other hand, irrigation can by itself serve as a risk-mitigating strategy adopted by farmers, with different type of risk exposure, expenditure and reasons for taking up PMFBY. It was then important to cover both irrigated and rainfed farmers.

We made use of agro-climatic zones to demarcate taluks (sub-district level) where farmers were dependent on rainfed and irrigation water sources. Using the enrolment data, we were able to identify taluks where the enrolled farmers were dependent on irrigation to cultivate a crop, say *jowar*, falling under an agro-climatic zone; and similarly, another set of taluks where the enrolled farmers were dependent on rain to cultivate the same crop but falling under a different agro-climatic zone. This ensured that we were not faced with farmer-specific unobservable factors such as risk-taking ability, motivation, and other factors which can render interpretation of our estimation results difficult.

In addition to this, we ensured that the potential taluk list had at least 15 farmers enrolled in a minimum of 14 gram panchayats, which was the IU, to be able to interview 10 enrolled farmers and five non-enrolled farmers. Once the potential taluks were identified, we then ensured through agriculture experts that the selected taluks were predominantly either rainfed or irrigated.

Sample determination:

Our calculations indicated that we required a sample of 405 farming households to be able estimate the uptake with a desired margin of error of five per cent and confidence interval of 95 per cent. The analysis of enrolment data for both *Kharif* and *Rabi* in 2016 indicated that the probability of uptake of crop insurance was approximately 20 per cent in Karnataka.[21] Given this, we assumed a design effect of 1.5 per cent with an intra-class correlation of four per cent and a response rate of 91 per cent which meant 405 farming households to be interviewed for

[20]Note that the type of irrigation for 4.43 per cent of enrolled farmers was not available.
[21]During *Kharif* in 2016, 1606710 farmers enrolled for the PMFBY scheme, approximately 20.51 per cent of farmers in Karnataka. During *Rabi* in 2016, 1731952 farmers enrolled, approximately 22.11 per cent of farmers in Karnataka. The total number of farmers was sourced from the Agriculture Census (2010-11).

each crop.[22] We multiplied this by two to arrive at the final sample of 810 since we wanted to cover paddy and *jowar* crops. The steps used in the calculation of sample are given below:

Step 1: Input the relevant figures to arrive at the required sample ("*n*") in Equation 1

$Margin\ of\ error = Z * \sqrt{(p(1-p)/n)}$ ---------- (Equation-1)

n = 246

Step 2: Assuming a design effect of 1.5 per cent with 15 respondents per gram panchayat, and a response rate of 91 per cent

Sample size (N) per crop = (DEFF *n)/(Response rate) ---------- (Equation-2)

N = 405

Step 3: Multiplying by three to arrive at the final sample size for paddy and *jowar*.

Final Sample size (FS) = N*2---------- (Equation-3)

FS = 810

Sampling strategy:

The sample requirement of 405 farmers per crop, where 10 enrolled farmers and five non-enrolled farmers are to be interviewed per GP, translated into the need for the survey to be conducted in 27 GPs for each crop. The 27 GPs were stratified into 14 where farmers were dependent on rains and 13 where they were dependent on irrigated sources, each with at least 15 enrolled farmers to allow identification of ten.

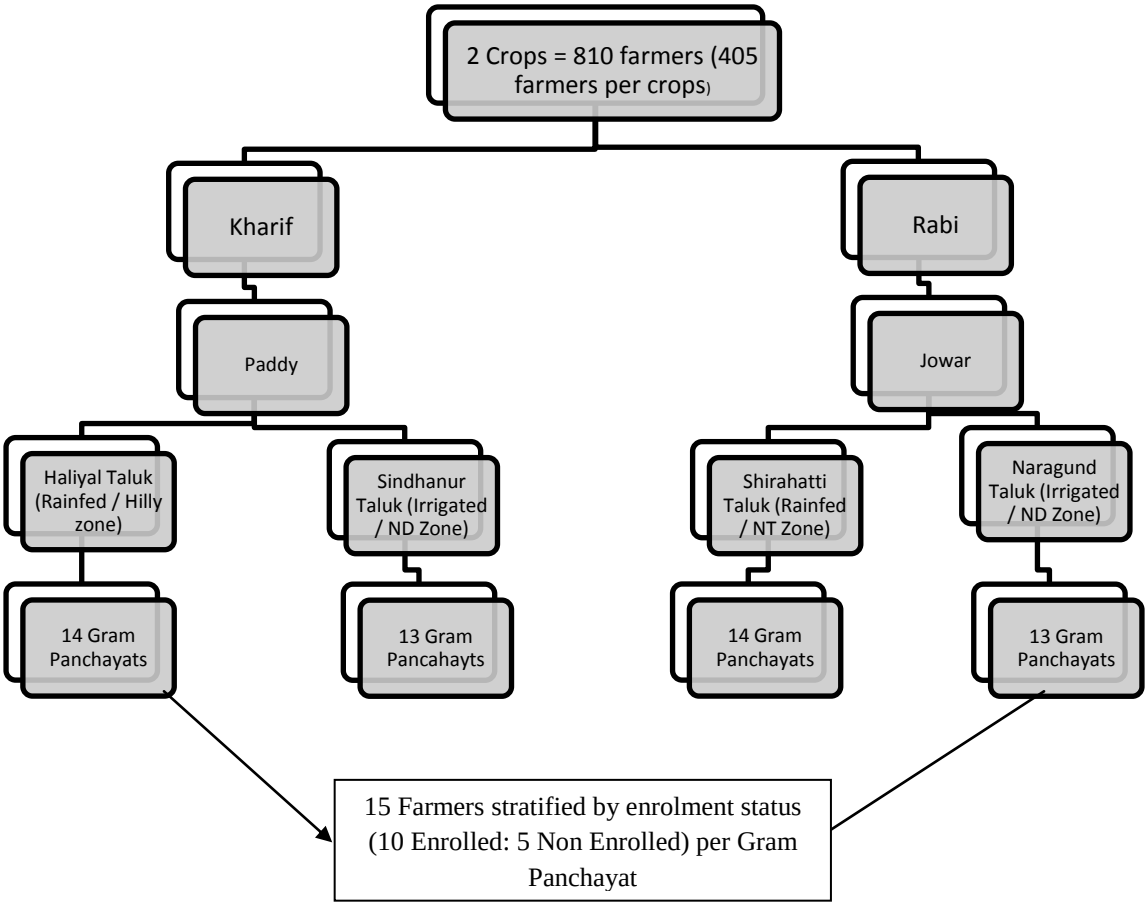
We examined the enrolment data for paddy for *Kharif* in 2016 and *jowar* for *Rabi* in 2016 to identify the taluks for our survey (Annexure Table 13.15 and 13.16 respectively). Within a taluk, we randomly selected the required number of gram panchayats (14 for rainfed and 13 for irrigated). Within a GP, we randomly selected the 10 enrolled farmers using the *Samrakshane* dataset[23] and five non-enrolled farmers through a listing exercise. Figure 6.1 presents the sampling strategy.[24]

[22]We scanned the extant literature, especially research conducted in Karnataka, on the intra-cluster correlation but did not find any relevant studies. Also, our experience from the dipstick study was suggestive of high similarity in responses, especially related to experiences about PMFBY, among farmers in a village. Given this, we decided that a high ICC of 4 percent, even though conservative, would provide us with enough sample population to facilitate the estimation process.

[23] The dataset maintained by the DoA, GoK, provides information at the individual farmer-level on economic status, area insured and so on.

[24] In our selection of taluks, we ensured that the exclusion of GP due to the condition of minimum 15 farmers enrolled for crop insurance is kept to the minimal, so as to not bias the sample. Fortunately, we did not have to exclude more than three GPs by selecting the taluks - Haliyal and Sindhanur for paddy, and Shirahatti and Naragund for *jowar*.

Figure 6.1: Sampling Strategy



Note: NET - North eastern transition zone; NED - Northern dry zone; ND - Northern dry zone; and NT - Northern transition zone.

Challenges faced in the field

The fieldwork was planned on the basis of geographical proximity of taluks, weather conditions and availability of farmers. For selection of the sample respondents, we made use of the farmer name, survey number (unique to each plot and assigned at the time of registration), and name of the farmer's father (or husband in the case of female land owner). These set of variables facilitated in the unique identification of pool of enrolled farmers, which was then randomised to arrive at the sample list of enrolled farmers.

The major challenge was identification of non-enrolled farmers. Here, we explored the definition of enrolled farmers - do we consider farmers who had submitted their application as enrolled or only those whose proposal has been successfully approved by the insurance company? As explained earlier, enrolled farmers were selected from the *Samrakshane* dataset, which contains names of farmers whose insurance proposals have been accepted by insurance companies. In addition, information about whether or not they are enrolled in insurance is not communicated to all the applicants. These two factors led to the applicants claiming that they were enrolled, even though their names were not actually in the list. Second, farmers had entrusted their relative/friend/trusted village member to enrol them in the insurance but did not

have any proof such as an acknowledgement slip to validate that their application had actually been submitted online. Our interaction with a few entrusted parties indicated that they had in turn submitted the proposal to the intermediaries such as Primary Agriculture Cooperative Societies (PACS), gram panchayat (GP) and bank officials. Since bulk of the applications were submitted to the intermediaries during the last week of enrolment, the lack of human and physical resources at the local level[25] resulted in critical details such as survey number, name, bank account, and crop insured being entered inaccurately and, at times, proposals being overlooked/missed completely. Another case included applications being submitted after the enrolment deadline, leading to rejection by the insurance company. In sum, these set of farmers were not enrolled under PMFBY. Finally, there was also the possibility of farmers claiming to have enrolled hoping that then they would also be eligible for insurance benefits.

Given these observations, we concluded that it would be difficult for the survey team to identify the non-enrolled on the basis of self-reporting during the listing exercise. To resolve this problem, we undertook several steps starting with defining enrolled farmers as those who have grown the notified crops and had their proposals accepted by the insurance company and reflected in the *Samrakshane* dataset; and non-enrolled as who have grown the notified crops but either did not apply for crop insurance or their proposal was not accepted by the insurance company and not reflected in the *Samrakshane* dataset. Using this definition, we identified non-enrolled farmers by comparing the survey numbers in the *Samrakshane* with those in *Bhoomi* (digitised land records) dataset. The survey numbers which did not appear in the *Samrakshane* dataset and also of not the same name as the enrolled farmer were identified and collated for the list of non-enrolled farmers. This list was then used to randomly select non-enrolled farmers for the survey. The survey team still faced difficulty as the selected respondents were not necessarily concentrated in one location and many of these farmers had grown crops other than the notified crops. Given the project deadline, the sampling strategy was revised and we sampled 10 enrolled farmers in all the selected gram panchayats and 14 non-enrolled farmers in five of the selected gram panchayats.

6.2. Final sample dataset and weighting strategy

Our response rate was about 96 percent, where 781 respondents had completed of the survey out of the total 810 farming households. However, an initial examination of the data showed that about 11 percent of the respondents had claimed that they had grown crops during the listing process but had not grown crops at all in the desired season. We had to remove these observations from our dataset thereby bringing down our response rate to 85 percent. The sample distribution is close to our desired ratio of 2:1 of enrolled and non-enrolled farmers and similar to the distribution observed in taluks where farmers are dependent on rains (Haliyal and Shirahatti); whereas this distribution is swapped with majority being non-enrolled in taluks where farmers are dependent on irrigation sources (Sindhanur and Naragund) (Table 6.1).

[25] In all the GPs, only one person was responsible for entering all the applications as there was only one computer system available. There were also other infrastructural challenges such as internet availability, processing time of the *Samrakshane* website where the applications are to be submitted and loss of power supply.

Table 6.1: Distribution of enrolled and non-enrolled farmers in population and sample

Taluk	Population in GPs selected for survey		Sample [Unweighted]		Sample [Weighted]	
	Enrolled	Non-enrolled	Enrolled	Non-enrolled	Enrolled	Non-enrolled
In absolute numbers						
Paddy - *Kharif*						
Hailyal	5,544	3,108	140	38	3708	3708
Sindhanur	2,406	13,814	107	60	13101	13101
Jowar - Rabi						
Shirahatti	8,509	2,901	118	61	5868	5868
Naragund	6,745	5,810	110	56	3766	3767
Total	23,204	25,633	475	215	26,443	26,444
In [row] proportion						
Paddy - Kharif						
Hailyal	0.64	0.36	0.79	0.21	0.50	0.50
Sindhanur	0.15	0.85	0.64	0.36	0.50	0.50
Jowar - Rabi						
Shirahatti	0.75	0.25	0.66	0.34	0.50	0.50
Naragund	0.54	0.46	0.66	0.34	0.50	0.50

Source: Primary Survey Data

We then devised a weighting strategy such that the responses from enrolled and non-enrolled farmers in each taluk lend themselves to statistical tests, incorporating adjustments for the over-sampling (under-sampling) of enrolled (non-enrolled) farmers to be able to yield reliable inferences about our population of interest. In addition, we accounted for the probability of selection of GPs, probability of selection of enrolled/non-enrolled farmers and correct for the response rate to arrive at the final weights. The formula to arrive at the probability weights is given below:

$$ProbailityWeightsj = \left[\frac{g}{G}\right] * \left[\frac{n}{N}\right] * \left[\frac{dn}{n}\right] * \left[\frac{1}{ri}\right]$$

j represents the gram panchayat, first component constitutes the probability of selection of GPs with `*g'* representing the number of GPs selected for the survey and `*G'* the total number of GPs. The second component constitutes the probability of selection of enrolled/non-enrolled farmers where `*n'* represents the total number of enrolled/non-enrolled surveyed to total number of enrolled/non-enrolled in the population. The third component is the correction factor for non-response rate, arrived by dividing the desired number of respondents (`*dn'*) by completed number of households. The final component is the adjustment factor[26]where responses from enrolled farmers are weighted by a factor of 0.33 and non-enrolled farmers by a factor of 0.67.

[26] The adjustment factor weights the responses from enrolled farmers by a factor of 0.33 and non-enrolled farmers by a factor of 0.67. This was undertaken to ensure that the over-sampling of the enrolled farmers and their responses do

7 Timeline

Table 7.1: Study timeline

Activities	February	March	April	May	June	July	August	September	October
Finalization of tools									
Literature review									
Primary survey (includes development of tools and selection of GPs)									
Farmers meetings									
Meeting with implementation agency personnel									
Scheme data analysis									
Secondary data analysis									
Semi structured interviews									
Primary data analysis									
Budget analysis									
Consolidation of report									
Proposal for phase II									
Submission of report and proposal for phase II									

While there have been no real adverse events, the process of winning the trust of various stakeholders involved in implementing the scheme has been a drawn out process. The suggestion of the Agricultural Commissioner to have a research assistant working in the Crop

not bias the overall findings and interpretation. To explain, the adjustment factor ensures equivalence between the enrolled and non-enrolled sample farmers to enable tests such as t-tests to understand whether or not the enrolled and non-enrolled farmers land ownership (in hectares) is statistically different. Without the adjustment factor, the estimation of responses may be biased purely because of the over-sampling of the enrolled farmers.

Insurance Department was useful, both in understanding the day-to-day functioning of the scheme as well as evolution of the policy guidelines that govern the programme. However, the research assistant was placed in the Department only in May 2017.This helped in providing us with daily observation of the implementation process. In addition, it also played a major role in allowing us to access various forms of data that were critical in understanding not just the scheme but also in planning the study design for the primary survey. However, this delayed our primary survey by a month or two.

In the field, contrary to our expectations, it became difficult to identify non-enrolled farmers in an insured unit. We therefore had to look for other forms of data to help us validate the fact that a farmer is indeed not enrolled. Obtaining this data again took time and led to further delays in the time line. However, this entire process allowed us to build the links that are necessary for obtaining data that helped us in refining the design. Another problem that we faced in our dipstick study was the presence of multiple schemes for input subsidy and drought relief which were also paid to farmers directly through their bank accounts, leading to farmers being confused about which scheme the surveyors are talking about.Therefore, we spent long hours in training field investigators before the primary survey to accurately establish that they were actually obtaining information about the right scheme.

8 Analysis and findings from the evaluation

8.1 Sample characteristics

The majority of the respondents in every taluk were male and Hindus (Annexure Table 13.17 and 13.18). In Haliyal, Shirahatti and Naragund, the minority community (including Jains and Muslims) constitute about 10 percent of the non-enrolled population. An examination of the distribution of respondents by caste (Annexure Table 13.19) indicates that about 20 percent of the non-enrolled belong to SC/ST/non-Hindu minority in Haliyal, Shirahatti and Naragund. Only in Sindhanur, the proportion of enrolled farmers belonging to these marginalised communities was the same for both enrolled and non-enrolled (about 23 per cent) farmers. Though BPL ration cards were the most-used cards for both groups, enrolled households generally had a higher proportion of users in almost all taluks except Haliyal. Universally, Antyodaya (the poorest) cards were used marginally more by non-enrolled households which show that often non-enrolled households belonged to either minority or economically vulnerable groups (Annexure Table 13.20). This could be a product of their social circumstances, fear to move outside their caste networks and the need to stay within the protection of the aids from it (Munshi and Rosenzweig, 2009). Third, in terms of education and dependency, except for the case of Haliyal, where about 80 percent of non-enrolled are illiterate, the distribution of educated farmers among enrolled and non-enrolled primary respondents is similar. (Annexure Table 13.22)[27].

Enrolled primary respondents were also more likely to be involved in paid or compensated labour in Haliyal as compared to non-enrolled farmers who are more likely to be working in unpaid labour (Annexure Table13.24). Further, about 90 per cent of spouses are engaged with uncompensated work across all the four taluks (Annexure Table 13.25). The dependency of children, parents and siblings on compensated labour varied widely from taluk to taluk. However, such participation showed that in most cases, irrespective of being enrolled or non-enrolled in PMFBY, households have created their own method of risk management either through consumption or external insurance policies where more members are engaged with other work and providing secondary incomes (Rosenzweig, 1988). Enrolled households were more likely to depend on the sale of crops for income in Shirahatti and Naragund, while the opposite was true of Haliyal and Sindhanur. Although, it should be noted that about 88 and 98 percent of enrolled and non-enrolled farmers in Sindhanur earned income through sale of crops which is very different from the other three taluks (Annexure Table 13.27) during 2016-2017[28]. Majority of households received drought relief during 2016-2017 except in Sindhanur (Annexure: Table 13.32). About 62 per cent of farmers received drought relief whereas only 3 per cent of non-enrolled farmers in Haliyal. The difference in receipt of drought relief between enrolled and non-enrolled in Shirahatti and Naragund is not as stark as one observed in Haliyal.

[27]Similar picture emerges when on examines the educational qualification of the spouse of primary respondents (Annexure Table 13.23)

[28] More than 95 per cent of households have not earned income through sale of livestock (Annexure Table 13.28), sale of agricultural equipment (Annexure Table 13.29), rent of agricultural land (Annexure Table 13.30), and rent of agricultural equipments (Annexure Table 13.31) during the period of 2016-2017.

8.2 Process of implementation of PMFBY in Karnataka

While following the standard guidelines prescribed by GoI, the state also has introduced measures to increase the insured cropped area and the number of farmers covered. The state pioneered use of technology in computerising land records[29] and this has come in handy for implementing crop insurance through the portal. The findings in this subsection are analysed to gauge the implementation processes during the *Kharif* and *Rabi* seasons in 2016 as well as following the process of implementation through *Kharif* in 2017.

Pre-notification stage (features and modifications):

a. The criteria for inclusion of a crop at GP and *hobli*/sub-taluk level as IU was lowered from 75 and 150 hectares to 50 and 125 hectares respectively, though the number of crops notified in 2017 remained the same as in 2016 (27 food and oilseed crops and 13 commercial/horticultural crops). This resulted in an increase in the number of IUs as well as the number of crops in an IU.

b. The process of clustering and bidding also witnessed modifications reflecting the evolving nature of the scheme in the state. The district-wise scale of finance for each of the notified crops was used to arrive at the sum insured and thereby the premium calculation. The state had decided to complete the bidding process in *Kharif* before March 2017 in order to ensure that adequate time for the notification and awareness campaign. With every passing day, the information regarding the monsoon forecast and pre-monsoon showers affect the enrolment which in turn impacts the APR quoted by insurance companies. For each cluster, the insurance companies are required to quote APRs for all district crop combinations for their bids to be evaluated. Any insurance company not quoting even for one of the total district-crop combinations within a particular cluster is disqualified for the bidding period. The call for bids were provided by the DoA to all the empanelled insurance companies which includes details such as: (i) IU-wise and crop-wise yield data for the last 10 years (from 2007 to 2016 *Kharif* season), (ii) IU-wise and crop-wise sown area for last four years, (iii) expected sown area and expected insurance sum 2017, (iv) list of calamity-declared taluks, and (v) crop-wise sum insured, indemnity levels, sowing and harvesting windows, staggered dates of enrolment and cut-off date for invoking prevented sowing.

c. The penalty clause for not reaching the target of 50 per cent of crop sown area was introduced. However, this was later removed as most insurance companies felt that the target was challenging given that insurance is voluntary for non-loanee farmers, which may depend on factors beyond the control of insurance companies. (Department of Agriculture, Government of Karnataka 07/03/2017)

d. A mandatory 20 per cent verification of insured crop was introduced. Verification of insured crop was meant to crosscheck whether the insured crop was actually grown in the field. This was critical especially when the insured crop area exceeded the estimated sown area for a crop in a particular district/cluster. However, this was reduced to five percent because of the shortage

[29] http://web.worldbank.org/archive/website00819C/WEB/PDF/INDIA_BH.PDF

in human resources required to undertake this task. (Department of Agriculture, Government of Karnataka 07/04/2017)

e. Cropped area estimates play a critical role in the clustering and bidding processes as they form the basis for all calculations. Errors in these estimations would result in the area discrepancy factor. In the event of the crop-insured area being more than the crop-sown area (owing to discrepancies in enumeration) an area correction factor is applied which affects the insurance payout for the entire crop/IU (Annexure: Note 12.3).

f. While the process of re-clustering and re-bidding resulted in insurance companies quoting lower actuarial premium rates (APR's)[30], it is also true that the process is time-consuming for insurance companies considering the number of crops notified. The L1 bidders are to be paid 50% of the premium subsidy upfront by the state government. Overall, the first round of bidding estimated subsidy premium subsidy outgo of INR 5500 crores and this was eventually brought down to around INR 880 crore by re-grouping the districts from only four clusters to ten clusters (refer to Annexure: Note 12.4 for a detailed account on the clustering and bidding process). (Government of Karnataka 22/05/2017)

Notification stage:

a. DoA issues a notification to enable the enrolment on completion of the bidding process which constitutes of the cut-off dates and premium payable by the farmer for each notified crop. District and taluk level offices issue similar notifications providing the details of IU-wise crops notified along with the cut-off dates, dates for invoking of prevented sowing and the premium payable by farmer per acre.

b. The DES plans for the CCEs to be conducted for all the crops across different IUs. CCEs are randomised and implemented through the use of the mobile app which also helps in coordinating with the insurance companies to allow them to witness the CCE.

c. The CCE consists of two stages. The first stage involves a random selection of any two villages within the IU followed by a random selection of two survey numbers within each of the two villages. After confirming that the notified crop is being grown on these two survey numbers, another four adjacent survey numbers that also grow the same notified crop is listed for each of the original two randomly selected survey numbers/village along with their probable harvest dates (It is called "1+4" survey number selection). The second stage involves the actual CCE being conducted on any randomly selected two survey numbers per village from the above pool of survey numbers. This random selection of plots where CCE is eventually conducted addresses the moral hazard issue to a large extent. Also, there should be a minimum of a seven day gap between these two stages as it is possible that the farmer decide to change the date of harvest. The frontline worker who is in contact with the farmer can accordingly change the probable date of harvest provided it's done within a minimum of 48 hours from the original date. According to DES, conducting and finalising of 85,000 CCEs in *Kharif* and about 1.5 lakh CCEs in a year is challenging due to the shortage of skilled manpower. .

[30] One of the aims of the bidding process is to ensure that the APRs quoted by the insurance companies eventually result in a premium subsidy outgo that is close to Karnataka's budget allocation for PMFBY implementation. This was achieved during the *Kharif* 2017 bidding.

Enrolment stage

a. In Karnataka, the practice of unified and single enrolment cut-off date for *Kharif* (i.e., July 31, as per the PMFBY guidelines) is modified to a staggered approach to accommodate the observed cropping patterns. The cut-off dates for *Kharif* 2017 are: 30June, 15 July, 31st July and 14 August for very early, early, normal and late crops. (Government of Karnataka 19/04/2017) This has reduced the problem of the last-minute rush for enrolment (both handling of physical application as well as server traffic). The staggering of cut-off dates also helped in avoiding adverse selection since the window for enrolment aligned with a specific crop's sowing period. At the local level, the officials are aware of these specific crop windows and can right away notice if the farmer is indulging in any high risk practices or not.

b. The State Level Coordination Committee for Crop Insurance (SLCCCI) fixed the last date for invoking prevented sowing/planting risk to be 15 days after the end of the sowing period, irrespective of the cut-off date for enrolment. The empanelled insurance companies again raised the possibility of adverse selection but finally it was agreed that the 75% of sown area criteria can only be ascertained after the completion of the sowing period. In situations wherein prevented sowing is invoked, new enrolment of farmers for the affected crop and areas would not be allowed after the date of invocation. For the 2017 *Kharif* season, prevented sowing has already been invoked in Belagavi, Haveri, and Tumakuru districts of Karnataka pertaining to a few crops such as soya bean (rainfed), groundnut (rainfed) and maize (rainfed and irrigated)[31].

c. Initially, a clause was included in the bid document mandating insurance companies to set up centres, *Raitha Samparka Kendras* (RSKs), specifically for the enrolment of non-loanee farmers. The physical space was to be provided by the DoA but all other IT infrastructure like laptops, printers, internet dongles, UPS along with ground staff was to be provided by the insurance companies. Subsequently, this clause was dropped from the bid document since it would result in high operational costs for the insurance companies which in turn would result in higher APRs. The Common Service Centres (CSC's) operating in the area are roped in to facilitate enrolment during 2017 and they are being paid @ INR 30/ per insurance proposal for registering it on to the portal.

d. Insurance companies have been found not to be playing any role except for providing application forms for enrolment. Given this, other stakeholders have taken up the responsibility to enrol farmers with varying levels of responsibility and incentives. In Haliyal, PACS played a major role in the enrolment of farmers, even though they are not officially contracted by either bank officials or insurance companies to undertake this activity. The data entry-related cost of the PACS was borne by the respective DCC banks from the service charges (four per cent of the premium) that they receive from the insurance companies. In the past decade, PACS have been the primary driver of farmer welfare schemes especially of crop insurance in Haliyal. In the case of PMFBY, PACS had collected the necessary documents, filled forms, entered the information online, and even allocated some of its own funds in advance to pay the premium amount ensuring that financial constraints of farmers during the sowing stage do not hinder the prospect of enrolment. Farmers who did not prefer to avail the SAOLs were advised to enrol at

[31] As an example: For maize (rainfed and irrigated) grown in Tumakuru district the cut-off date for enrolment was 31st July 2017 whereas the cut-off date to invoke prevented sowing was 14 August, 2017.

the bank as a non-loanee farmer. There were a few cases of farmers who had SAOLs from PACS for growing sugarcane, but had also taken insurance for a notified crop as a non-loanee farmer from a commercial bank (since sugarcane was not a notified crop).

In the other three taluks, the GP office and banks were the primary units where information was disseminated to farmers. Our interactions with farmers revealed that the proposal forms for the crop insurance were made available at the GP office, so that the farmers did not have to stand in long queues.[32] The local GP had assigned one of its own staffs with the task of collection of all the mandatory documents for submission.

e. The state government has made it compulsory for all insurance companies to pay INR 5 as service charges to the GP for every enrolment during 2017. In general, farmers submitted the documents to either a PACS or GP or bank officials with information about crops to be grown and loanee status. The officials entered information such as sum and area insured to complete the submission process. At the end of this process, the farmers were given an acknowledgement slip marking successful submission of the proposal. There are three additional steps consisting of (i) verification of the proposal by bank manager, (ii) acceptance and forwarding of the proposal by the bank manager to the insurance company and (iii) acknowledgement of the proposal by the insurance company. The farmers are informed at each stage and the receipt of acknowledgement message by the insurance company is considered as acceptance and actual enrolment under PMFBY.[33] In reality, the farmers are unaware of these processes and assume that they are enrolled when they receive the acknowledgement slip at the time of the proposal submission.

f. We tracked the number of days it takes for a proposal to be submitted and to be finally accepted by the insurance company for a random subset of the sample chosen for our survey. From Table 8.1, it is evident that it takes about 30 days, on average, for the proposal to be acknowledged by the insurance company from the date of submission. In this entire process, the last stage takes the longest. The insurance companies take more than 15 days on average to acknowledge the proposal. In Sindhanur, it was even longer at 28 days. The proposal can be rejected at any point during these stages. The confusion or lack of awareness among farmers about the actual enrolment under PMFBY combined with the fact that the proposals are submitted at the last moment and a process that takes more than a month for farmers to actually know whether or not the proposal is accepted does not allow any time at all for them to re-submit in case of rejection within the stipulated submission date. This increases the likelihood of farmers not being enrolled despite the fact that they had incurred expenses in submitting the proposal. In the case of rejection, it can even result in dissatisfaction and loss of trust in crop

[32] This was not consistently followed across all the GPs. There were cases where farmers had to invest a lot of time and energy just to get the forms. One farmer in Shirahatti taluk reported that he had to wait in a long queue to meet the bank officials to get the required details about PMFBY. Farmers also reported that they had to a make at least two-three day visits to the bank office over a period of three weeks to complete the application process. It should be noted that this entire process involves activities such as attainment and submission of the proposal form. The farmers have to rely upon DoA officials, GP officials or friends to understand and fill the proposal forms.

[33] We are not certain whether the farmers are informed about the rejection of their proposal as we did not come across any mobile messages. However, few enrolled farmers showed us messages starting from the submission of the proposal to the acknowledgement of it by the insurance company.

insurance when they find out about their actual status during the claim stage.[34] Also, because of the mandatory enrolment of loanee farmers, the banks may enrol them under a notified crop for the area while the farmer may not actually grow that crop.

[34] Another point to be noted is the return of the premium payment in case of rejection. The DoA has instituted a clause that the insurance companies ought to pay the premium within 15 days in case of rejection. If not, the premium has to be repaid along with interest rate.

Table 8.1: Different stages in acceptance of proposal by insurance companies

Stages of acceptance of proposal	N*(subset of sample farmers)*	Range*(in days)*	Min*(in days)*	Max*(in days)*	Mean*(in days)*	SD
Haliyal						
From submission to verification by bank manager	75	29	0	29	11	8
From verification by bank manager to forwarding to insurance company	75	24	0	24	11	6
From forwarding to insurance company to acknowledgement by insurance company	75	18	0	18	16	3
Sindhanur						
From submission to verification by bank manager	68	29	0	29	4	6
From verification by bank manager to forwarding to insurance company	69	36	0	36	8	9
From forwarding to insurance company to acknowledgement by insurance company	69	62	0	62	28	13
Shirahatti						
From submission to verification by bank manager	82	19	0	19	7	5
From verification by bank manager to forwarding to insurance company	82	16	0	16	5	4
From forwarding to insurance company to acknowledgement by insurance company	82	68	0	68	19	13
Naragund						
From submission to verification by bank manager	120	19	0	19	6	4
From verification by bank manager to forwarding to insurance company	120	15	0	15	3	3
From forwarding to insurance company to acknowledgement by insurance company	117	95	0	95	18	19

Source: *Samrakshane* portal

Note: N reports the number of subset of sample farmers who were randomly selected. The information about the days taken to pass through each of the stage was then manually collected from *Samrakshne* portal for these set of farmers.

Claims Stage:

a. The government has declared that the claims must be paid before the sowing for the next season begins. However, it was found that the *Kharif* season 2016 claims were not fully settled as of October 2017.They should have been ideally settled before the *Rabi* season's sowing. Two major reasons explain the delay in claim settlements: (i) insurance companies contesting the yield estimates based on the CCE results and estimating the insurance payout accordingly, (ii) enrolment errors. The number of CCEs per crop at the GP level is four and per crop at *hobli* level is 10 across crop and agricultural zones. This is based on the NSSO sampling strategy, and translates itself into conducting more than 10,000 CCEs per year. Both agricultural insurance companies and government officials feel the need to revisit the CCEs and make them more representative of the IU, especially in case of certain multi-picking crops like cotton (Annexure: Note 12.5).

b. The absence of the proper account number with Indian Financial System Code (IFSC) and mismatch of name between the application and the land record/bank account have also resulted in delay with respect to claims settlement.

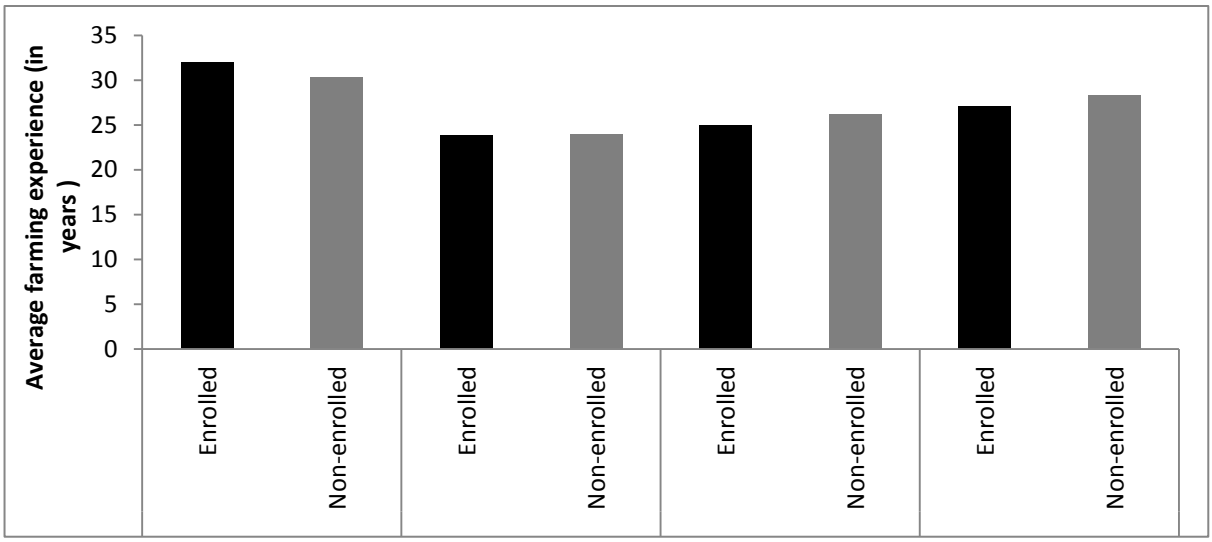
c. Farmers are not informed once the enrolment process is completed. The farmers are neither informed about whether their application is accepted by the insurance company in a timely manner nor about their eligibility for claims. This complete absence of information has resulted in lot of unrest among the farmers who had paid for the insurance and have not yet received claim settlement. In many cases, farmers were found to be visiting the DoA, banks and PACS to seek information about the claim settlement.

8.2. Cropping, loan and risk profiles of farmers:

Land holdings

All the farmers surveyed across the four taluks cultivated their own land except less than 1 per cent who cultivated leased land. Haliyal taluk is an exception where non-enrolled farmers cultivated land was still owned by the government, as per the RTC records. The average years of farming experience for all farmers across all four taluks is more than 20 years. Based on the 't' test for equality of means, the differences in the average years of farming experience between enrolled and non-enrolled farmers is insignificant across the taluks (Figure 8.1).

Figure 8.1: Average years of farming experience



Source: Primary Survey Data

The weighted average land size by enrolled and non-enrolled is presented in Table 8.2 along with the weighted distribution of farmers across the taluks. The average land sizes in Haliyal and Sindhanur taluks is smaller compared to those in Naragund and Shirahatti taluks. The difference in land sizes between those enrolled and non-enrolled is insignificant, except in Haliyal taluk. In this region, non-enrolled farmers live on the margins of the reserve forest and their land belongs to the state, according to the RTC. Therefore they cannot enrol. The F statistic indicates that the weighted distribution of land sizes is significantly different in Haliyal. However, the value of this statistic is insignificant for those from other taluks. Most of the farmers across the taluks are marginal, small or medium farmers owning less than four hectares of land.

Table 8.2: Average land size by taluks (in hectares)

Taluk	Enrolled	Non- enrolled
Haliyal	1.70 (11.79)	0.86(6.24)
Sindhanur	1.93 (18.45)	1.73(11.47)
Naragund	2.18(15.99)	2.54(28.71)
Sirahatti	2.21(18.97)	1.82 (12.45_)

Source: Primary Survey Data

Note: Standard deviation in parentheses.

Although most farmers own only one plot of land across taluks, a considerable number of enrolled farmers in Shirahatti and Naragund taluks own more than two plots of land. Non-enrolled farmers rarely own more than two plots of land. The average proportion of current fallow land is the lowest for *Kharif* and then for *Rabi* seasons. In summer, across the four taluks, the land is not cultivated and is left fallow.

Table 8.3: Percentage distribution of farmers by the number of plots owned

Number of the plots owned	Haliyal		Sindhanur		Shirahatti		Naragund	
	Enrolled	Non-enrolled	Enrolled	Non-enrolled	Enrolled	Non-Enrolled	Enrolled	Non-enrolled
1	92.29	100	95.28	98.41	74.69	85.97	74.69	96
2	6.53	0	4.72	1.59	15.83	9.43	19.01	4
3	1.18	0	0	0	6.78	0	4.82	0
4	0	0	0	0	2.69	0	1.47	0
5	0	0	0	0	0	4.60	0	0

Source: Primary Survey Data

Table 8.4 represents the crops grown during the various seasons across the four taluks. Most of the rainfall occurs during the *Kharif* season; therefore, paddy is grown intensively in both Haliyal (rainfed), and in Sindhanur (irrigated). In general, the percentage of land cultivated during *Rabi* season is relatively lower than in *Kharif*.

Table 8.4: Crops grown

Taluks	***Kharif***
Haliyal	Paddy, maize, sugarcane, sunflower
Sindhanur	*Bajra*, Bengal gram, chilli, green gram, groundnut, *jowar*, maize, onion, sugarcane, sunflower, *tur dal*, paddy
Sirahatti	Bengal gram, chilli, green gram, groundnut, *jowar*, maize, onion, sugarcane, sunflower, *tur dal*
Naragund	Bengal gram, green gram, groundnut, maize, onion, sugarcane, sunflower
	Rabi
Haliyal	Groundnut
Sindhanur	*Bajra*, Bengal gram, *jowar*, mustard, paddy, sunflower, *urad dal*
Shirahatti	Bengal gram, groundnut, *jowar*, maize, onion, paddy, red gram, sunflower
Naragund	Bengal gram, maize, *jowar*, onion, red gram, sunflower, wheat
	Summer
Haliyal	Green gram

Source: Primary Survey Data

Livestock

More than 60 percent of surveyed farmers own livestock - which is about 83 per cent in Haliyal, 70 per cent in Sindhanur, 65 percent in Shirahatti and 71 per cent in Naragund. The most common livestock is generally milch cows or buffaloes or draught buffaloes. Draught animals as expected are often owned in pairs. Few farmers appear to own goats and sheep in Haliyal, or Sindhanur (less than 5%), In Naragund taluk, a considerable percentage (7.69 %) of farmers own sheep. The FGDs suggest that most farmers reduce the amount of livestock owned in the case of any drought or crop failure.

Access to irrigation, ownership of agricultural implements and expenditure on crops

The proportion of farmers who have access to irrigation generally varied between three and twenty per cent, except in Sindhanur, where the major crop is irrigated paddy and therefore the access to irrigation is as high as 80-90%. The difference in access to irrigation is significant for the enrolled and non-enrolled only in Haliyal taluk. While all farmers owned some equipment or the other, nearly 13 to 30% reported owning a tractor followed by hiring of the two forms of labour (human and animal), hiring machinery and other expenses.

Yields

In our survey, we collected self-reported yield estimates which are in terms of the total quantity of a crop produced in terms of bags or baskets. We used the lower estimate of self-reported values as there was no single, uniform conversion rate was available for bags or baskets. The threshold, as well as the actual yield as per the CCEs in these taluks, is presented in Annexure: Table 13.33, alongside the self-reported estimates. These values should be interpreted with caution. Rather than serving as representative estimates, they represent the possible variations within a GP.

Loan behaviour

A 2017 report on the performance of crop insurance schemes reported that 97 percent of enrolled farmers under NAIS opted for sum insured equivalent to loan amount indicating either that banks issued loans only to that extent or farmers take up insurance to ensure that the loan amount can be repaid (Ministry of Agriculture and Farmers Welfare, 2017). Thus it is important to understand the loan behaviour of farmers. Most farmers were more inclined to take up a cash loan; loans in kind were observed to be a distant second option (Annexure Table 13.34 and 13.35). From Table 8.5, it is interesting to note that Haliyal has the least average amount, though the PACS in the region are very proactive. It is also one of the areas that receive better rainfall than others, though they are dependent on rainfall alone. The highest average of outstanding loan amount is reported from Sindhanur and Naragund, which though notified for irrigated paddy and *jowar* respectively, does not have irrigation facilities for all the *hoblis*, as some of the villages are very far from the canal.

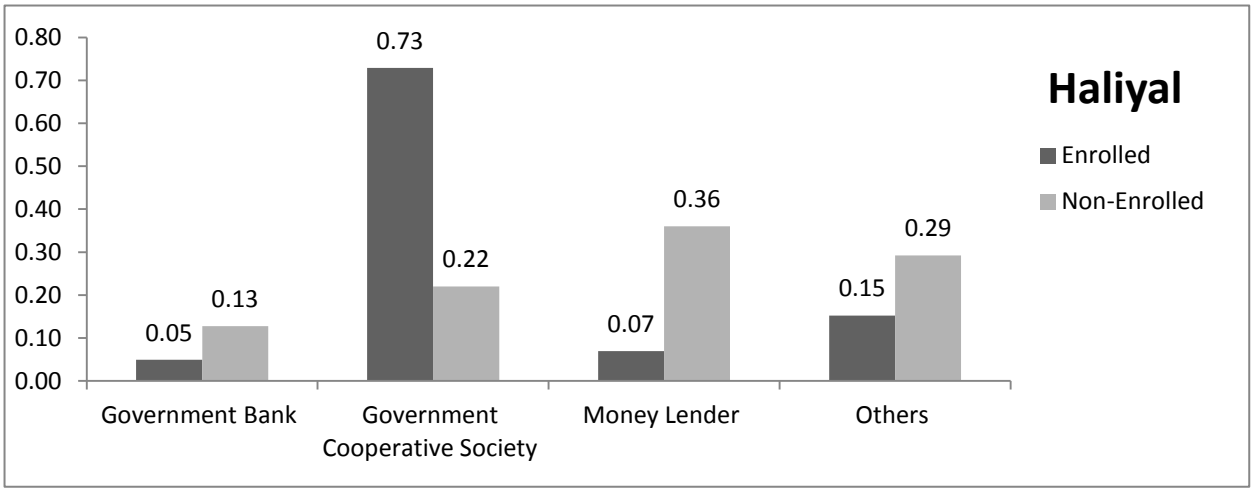
Table 8.5: Summary descriptive of outstanding loans per household (in INR)

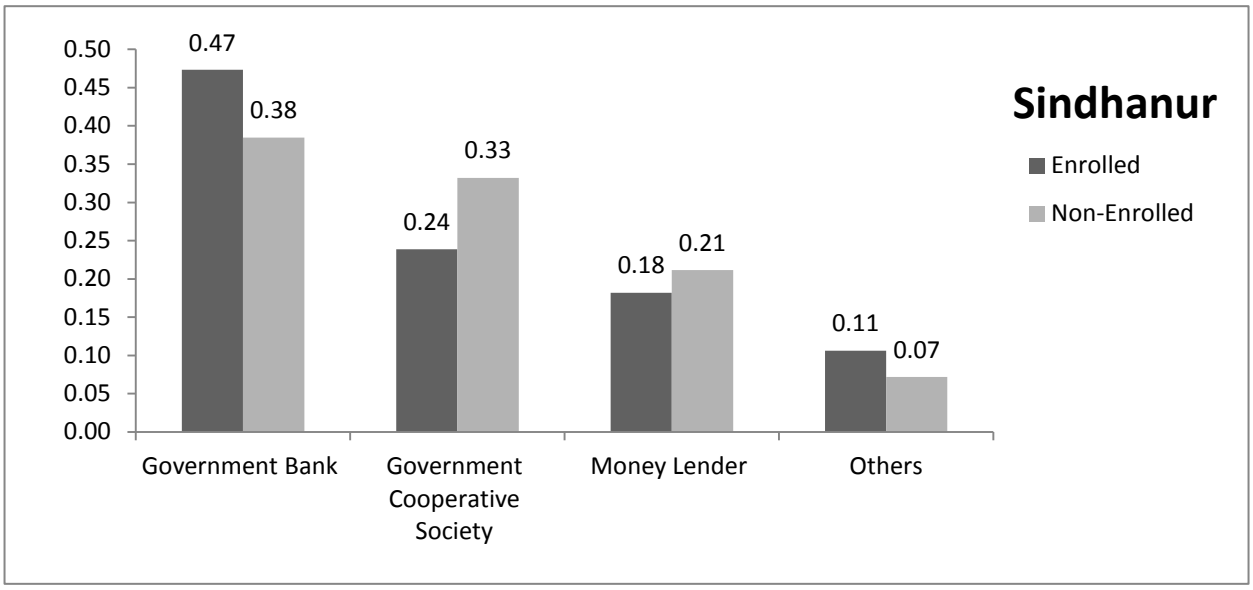
Taluks	Average	SD	50th percentile	10th percentile	90th percentile
Haliyal	79,134	128787	40,000	0	1,71,000
Sindhanur	2,33,133	290511	1,50,000	37,000	5,00,000
Shirahatti	2,21,466	273536	1,40,000	30,000	5,05,000
Naragund	2,48,132	295739	1,80,000	25,000	5,50,000

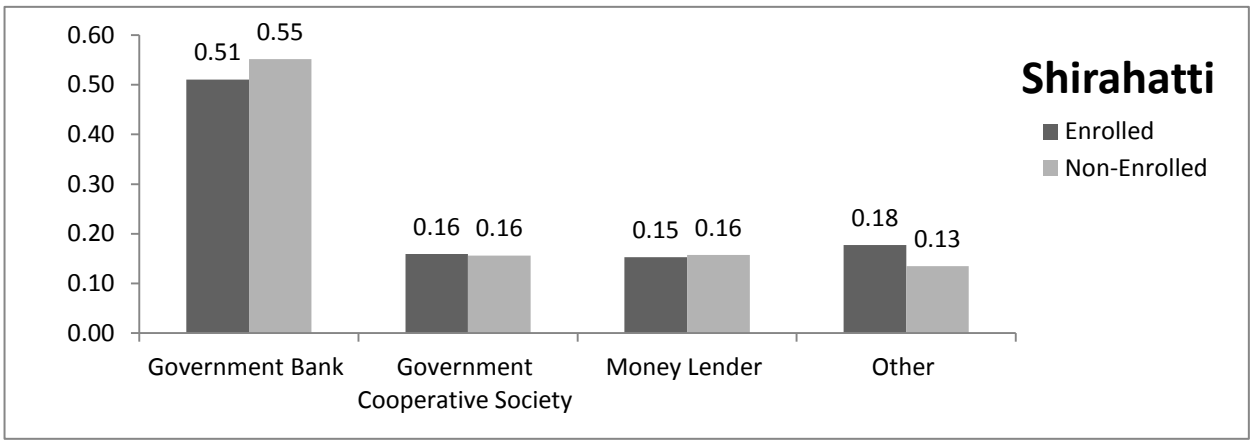
Source: Primary Survey Data

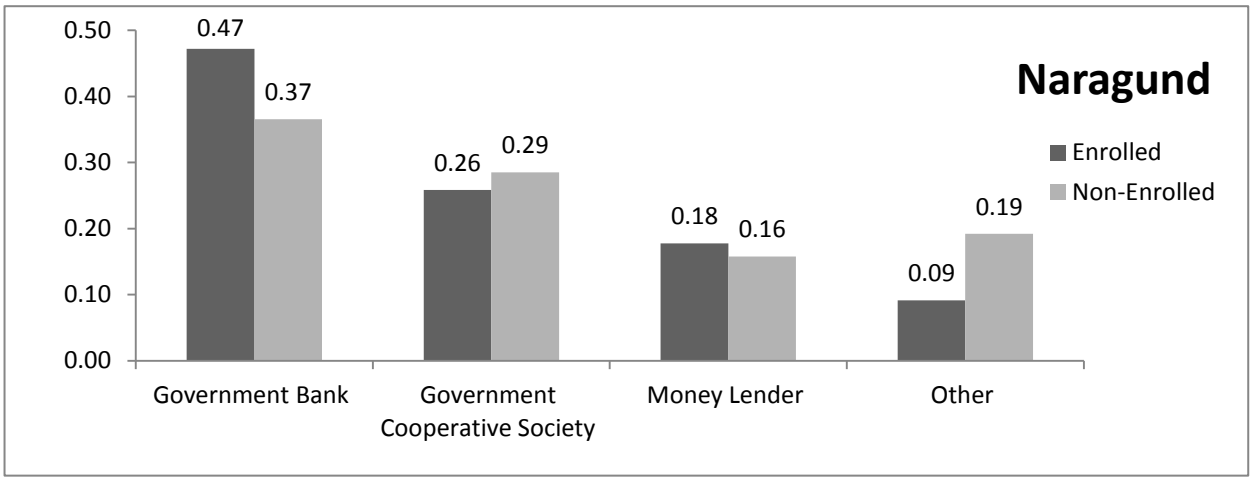
Majority of the loans were taken from either government banks or government cooperative societies across the four taluks (Figure 8.2). Money lenders still constitute a significant source for loans among both enrolled and non-enrolled farmers in Sindhanur, Shirahatti and Naragund. In Haliyal, about 36 per cent of non-enrolled farmers had taken loan from money lenders whereas it was only seven per cent of the enrolled farmers.

Figure 8.2: Source of Loans









Source: Primary Survey Data

Note: Government cooperative societies are those that are funded by the government for non-profit purposes; others include cooperative societies run by private institutions/individuals, NGOs/SHGs, employers, friends/relatives, private bank and others.

The most common reason to opt for a loan was the improvement of the farm, which included a) the bunding of the land to improve the soil, b) irrigation infrastructure, such as bore wells, and c) the growth of horticulture crops (Annexure Table 13.36 and 13.37). From these, it makes sense that farmers would extensively take loans for irrigation facilities in Karnataka, one of the driest states in the country, where drought is common (Kalavakonda and Mahul, 2005). It is also known that investing in certain types of irrigation, such as tube wells provides security to farmers from such drought-prone states (Dhawan, 1985).

Risks experienced by farmers

Majority of farmers reported drought to be the top-most risk faced not only in relation to *Kharif*/*Rabi* 2016, but in general as well, in Haliyal, Shirahatti and Naragund. In Sindhanur taluks, where the major crop is paddy, deficit rainfall - and not drought - is reported as the topmost risk. Surprisingly, majority of respondents (except in Haliyal) reported that they are not worried about crop loss due to weather-related changes such as rainfall timing, precipitation, etc. In other words, though droughts and deficit rainfall are the most-experienced risks, these are not viewed as the main reasons for crop loss[35].

Second, small and marginal farmers face similar risks as medium and large farmers such as non-availability of labour force and agricultural inputs (seeds, fertilisers and equipment), lack of information and low sale prices fixed by local traders. Overall, our findings indicate that farmers experience mostly production risks and price risks to a lesser extent, as defined by Moschini and Hennessy (2011)

[35]Here, we have to take this interpretation with a bit of caution for the following reasons: (a) we have to think about the contextual use of the words "weather changes" and "crop loss" versus "drought" and "crop loss" in a sentence. The relationship between the words in the latter ("drought" and "crop loss") is more commonly used and the relationship well established. However, the same cannot be said of the former as "weather changes" could have been used in a broader context; and (b) it may also be important to enquire whether "drought" was perceived to be an immediate/short-run problem (especially given the recent years of drought in Karnataka) whereas "weather changes" perceived as an "long-term" issue. These could have played a role in the famers' perception and weather-related changes resulting in crop loss.

Table 8.6: Risks faced by farmers in study taluks

Crop / Season	Taluk	Production risk	Price risk	Risks covered under PMFBY	Stages at which risks are faced
Paddy (*Kharif*)	Haliyal	1. High wage rate (6%) [Enrolled (5%) and non- enrolled (7%)] 2. Lack of information about new seed varieties [non-enrolled (7%)]. 3. Non-availability of seeds, fertilisers, manure and other related inputs at the right time [Enrolled (3%)]		1. Drought (80%)	**During sowing and standing crop stage**
	Sindhanur	1. High wage rate (23%); 2. Non-availability of labour force (16%) [Enrolled (21%) and non- enrolled (11%)]; 3. Lack of information about new seed varieties and techniques (19%) [Enrolled - (12%) and non- enrolled (25%)];	1. Low Sale Price of the produce fixed by local traders (Non Enrolled-11%);	1. Pests* (15%) [Enrolled (17%) and non-enrolled (13%)]; 2. Deficit rainfall* (12%)	

Jowar(Rabi)	Shirahatti	1. High wage rate* (15%) [Enrolled - 18% and non- enrolled - 12%]; 2. Concern about soil quality* (11%) [Enrolled (7%) and non-enrolled (11%)]		1. Drought (98%);	
	Naragund	1. High wage rate * (17%) [Enrolled - 13% and non- enrolled - 22%]; 2. Lack of information about new seed varieties and techniques** (10%) [Enrolled (7%) and non-enrolled (12%)]		Drought (93%);	

Source: Primary Survey Data

Note: * - includes all risks faced by farmers in cultivating the crop in general; and ** - includes all risks faced by farmers in cultivating the crop during *Kharif*/*Rabi* in 2016. Second, the table reports only the top-ranked responses to questions on risk faced by farmers while cultivating the notified crop. Refer to Annexure Tables 13.38-13.41 for item-wise responses on risk experienced by enrolled/non-enrolled farmers.

Risk management strategies adopted by farmers:

Following OECD (2009), we categorise the different risk management strategies adopted by farmers in our survey into three groups, namely: risk prevention, risk mitigation and risk coping. OECD (2009) defined risk prevention as strategies adopted to reduce the probability of an adverse event; risk mitigation as strategies adopted to reduce the potential impact of an adverse impact; and risk coping as strategies adopted to relieve the impact of an adverse event. The different categories of risk management strategies as reported by farmers are given in Table 8.7.

Table 8.7: Adoption of risk management strategies

Crop / season	Taluk	Use of risk management strategies		
		Risk prevention	**Risk mitigation**	**Risk coping**
Paddy (*Kharif*)	Haliyal	1. Avoiding experimentation with new seeds/fertilisers/techniques (17%) [Enrolled (18%) and non-enrolled (16%)]	1. Investment/adoption of better pest management (11%) [Enrolled (2%) and non-enrolled (20%)] 2. Crop diversification (21%) [Enrolled (17%) and non-enrolled (26%)] 3. Intercropping (14%) [Enrolled (24%) and non-enrolled (5%)] 4. Investment in farm improvements (13%) [Enrolled (7%) and non-enrolled (20%)]	1. Crop Insurance (3%) [Enrolled (7%) and non-enrolled (0%)] 2. Disaster relief* 3. Migration to engage in non-farm income*
	Sindhanur	1. Participating in activities to improve dams and irrigation systems (16%) [Enrolled (16%) and non-enrolled (15%)] 2. Avoiding experimentation with new seeds/fertilisers/techniques (11%) [both enrolled and non-enrolled)	1. Investment/adoption of better pest management (12%) [Enrolled (9%) and Non Enrolled (16%)] 2. Crop diversification (18%) [Enrolled (19%) and non-enrolled (17%)] 3. Sharing of agricultural equipment and irrigation sources (5%) [Enrolled (7%) and non-enrolled (4%)]	1. Crop Insurance (3%) [Enrolled (4%) and non-enrolled (3%)] 2. Buffer stock accumulation of crop produce (8%) [Enrolled (9%) and non-enrolled (7%)] 3. Migration to engage in non-farm income*

***Jowar* (*Rabi*)**	Shirahatti		1. Crop diversification (37%) [Enrolled (32%) and non-enrolled (42%)] 2. Inter cropping (20%) [Enrolled (14%) and non-enrolled (27%)] 3. Plot diversification (6%) [Enrolled (7%) and non-enrolled (6%)] 4. Mixed farming (6%) [Enrolled (9%) and non-enrolled (3%)]	1. Crop Insurance (12%) [both enrolled and non-enrolled] 2. Migration to engage in non-farm income*
	Naragund		1. Crop diversification (43%) [Enrolled (46%) and non-enrolled (39%)] 2. Intercropping (30%) [Enrolled (14%) and non-enrolled (46%)] 3. Investment in farm improvements (10%) [Enrolled (16%) and non-enrolled (4%)]	1. Crop Insurance (4%) [Enrolled (9%) and non-enrolled (0%)] 2. Migration to engage in non-farm income*

Source: Primary Survey Data

Note: 1. Table 8.7 reports the first response from the farmers to the question 'What were the risk mitigation strategies adopted by you to protect against crop failure?"' The percentage represent the number of respondents who had reported adopting a particular risk management strategy of the total number of farmers in the sample. The complete list of risk management instruments adopted by farmers in Haliyal, Sindhnur, Shirahatti and Naragund are given in Annexure: Table 13.43-13.46.

2.GoK released INR 5,000 per farmer as disaster relief during 2016.

3. *Migration could be categorised under any of the three types of risk management instruments.

Under risk prevention strategies, it was a bit surprising to note that farmers who primarily engage only in Kharif season [Haliyal and Sindhanur taluk] adopt any measures to prevent the probability of an adverse event. The common risk prevention strategies adopted by farmers include avoiding experimentation with new seeds/fertilisers/techniques. This response could be manifestation of the adverse events experienced by farmers in Karnataka in recent years (since 2011 - except for 2014-15), including poorer yield productivity due to drought, deficit rainfall, deteriorating groundwater and soil quality in addition to lower income due to market forces. The risk averse mindset of farmers means that they may not be willing to explore and adopt newer techniques/inputs. Both enrolled and non-enrolled farmers have reported participating in activities aimed at improving dams and irrigation systems in Sindhanur. These activities are

generally undertaken by the community and not by individual farmers, engaging with local administrative and political establishments to implement distributary canals or release water from the reservoir to meet requirements for growing paddy.[36]

Under risk mitigation strategies, crop diversification which improves the farmers' crop portfolio and reduces dependency on a single crop is the most common strategy adopted across the four taluks. Strategies of a similar nature include intercropping - where enrolled farmers constitute higher percentages compared to non-enrolled farmers in Haliyal and the reverse is true in Shirahatti and Naragund. In both Shirahatti and Naragund, a smaller percentage of farmers have also adopted plot diversification and mixed farming to reduce their risk exposure to a single crop. Other risk-mitigating strategies common in all four taluks include investment/adoption of better pest management, mixed farming and sharing of agricultural equipment.

Only about seven percent of enrolled farmers consider crop insurance as the top priority measure of relief from the impact of crop loss in Haliyal. In Sindhanur and Naragund, this is considered by only a small percentage of farmers [about three to four per cent]. About 12 percent of farmers in Shirahatti reported crop insurance as their first response to mitigate crop loss. Small and medium farmers often engage in non-farm activities to sustain their livelihoods. These activities were not reported as a risk mitigation strategy in our survey, thereby hindering in estimating the percentage of households engaging in such activities. We still categorise these non-farm activities, specifically migration to other states or cities to meet the shortfall in income through agriculture, as a risk management strategy, following the extant literature. In Haliyal, the majority of small and medium farmers with more than one male child send the adult male child to the neighbouring state, Goa, to engage in non-farm employment during off season. In Sindhanur, small and medium farmers migrate to another neighbouring state, Andhra Pradesh, to engage in road construction and other non-farm activities. The small and medium farmers from Shirahatti and Naragund migrate within Karnataka for construction work.

In sum, these findings indicate that farmers rely upon informal measures at the household or community levels as measures to mitigate agricultural risks. The farmers do not necessarily possess knowledge and access risk management instruments that may be available to them to mitigate crop loss/shortfall in income through agricultural activities. Third, imperfect knowledge about the relationship between agricultural risks faced by farmers and household decision-making on employment, education, asset ownership induces more reliance upon informal measures.

[36]In line with this, farmers from Sindhnur, Manvi and Deodurg demanded implementation of the proposed 5A Pamanakallur Distributary Canal Project in September 2016 [http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/Farmers-in-Raichur-march-on-foot-seeking-5A-canal/article14627517.ece - Accessed as on October 1st 2017].

8.3 Farmers' experience of PMFBY:

Source of information about PMFBY:

About 44 percent of respondents reported that PACs and banks in Haliyal were their main sources of information. Banks and GP officials were the sources of information in Sindhanur, Shirahatti and Naragund. In addition, about 14 percent of enrolled, medium and large farmers had sourced information from DoA officials compared to only three percent of enrolled small farmers in Haliyal. In Sindhanur, about 38 percent of enrolled large farmers had accessed information through the newspaper/radio/internet. Unexpectedly, neighbours/relatives/other friends have been a major source of information across all taluks, especially for enrolled, non-loanee farmers.

Table 8.8: Source of information about PMFBY

Haliyal	Sindhanur	Shirahatti	Naragund
1. Neighbours/other farmers (29%); 2. PACs (22%); 3. Bank agents (20%); 4. Relatives/other friends (13%)	1. Bank agents (69%); 2. Panchayat/taluk officials (13%) 3. Neighbour/other farmers (10%)	1. Panchayat/taluk/district official (30%); 2. Bank agents (25%), 3. Neighbour/other farmers (22%)	1. Bank agents (46%); 2. Panchayat/taluk/district official (30%)

Source: Primary Survey Data

Note: The percentage represents multiple responses from those respondents who had reported to have enrolled in PMFBY in our survey, irrespective of our definition of enrolment status. In the above table, the percentages will not add up to 100 as only the significant items are reported. Refer to Annexure: Table 13.47-13.58 for greater detail.

As reported earlier, our findings indicate that majority of farmers avail seasonal agricultural loan during the *Kharif* season. The insurance acts not only as a safety mechanism for the farmer against crop loss, but also to bank/PAC officials as they can be assured of loan repayment. A recent CAG report found that the sum insured actually equalled the loan amount borrowed in the states it studied (Andhra Pradesh, Gujarat, Tamil Nadu). Our interactions with officials do suggest indicative evidence where bank officials have submitted proposals with higher sums insured to match the loan amounts disbursed to farmers, even if it meant by submitting the proposal with a crop not grown by the farmer.[37]

Finally, the complete lack of engagement from insurance companies results in vacuum of information not only at the enrolment stage but also at the claims stage. Our researcher positioned at the DoA noted that a significant number of farmers travel from distant and rural villages to Bengaluru (where the state's DoA is located) just to get information on whether or not they are eligible for claim settlements. This not only leads to increased out-of-pocket expenditure for farmers but also result in negative perceptions of the scheme itself. Secondly,

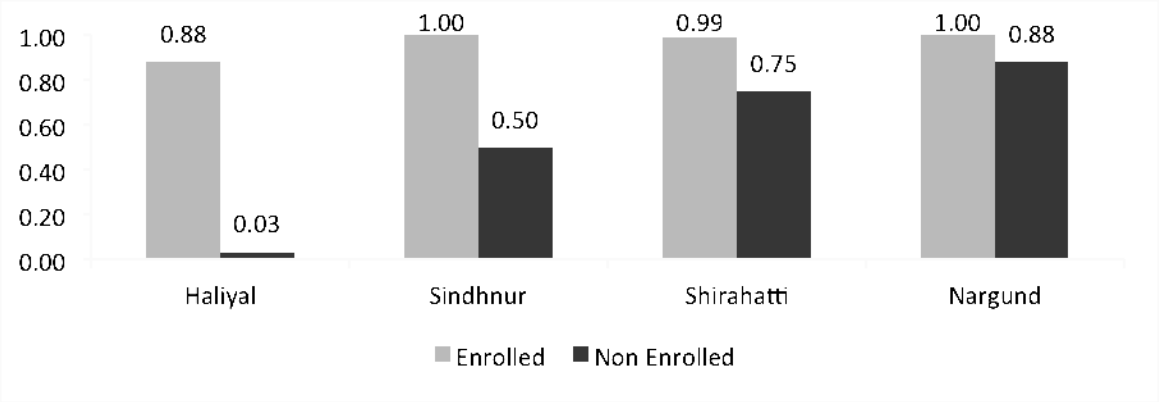
[37] Furthermore, farmers do not avail seasonal agricultural loan during the *Rabi* season. Therefore, incentives for banks to undertake enrolment activity may be characteristically different here. A plausible motivating factor can be the significant role played by DoA officials in issuing instructions to take up insurance which increases during the *Rabi* season. One example would be the several measures including acceptance of demand drafts, delay of submission dates for some major crops, acceptance of mass submission of proposals adopted by the DoA during the *Rabi* season of 2016 to accommodate the financial constraints experienced due to demonetisation.

farmers are not aware of the accountability structure and assume that the DoA is responsible for the entire scheme.

Awareness of PMFBY:

Figure 8.3 reports the status of general awareness of PMFBY scheme among the respondents. Almost all enrolled farmers have reported that they are aware of the scheme, except for those in Haliyal where only 88 percent of enrolled farmers are aware of it. Among non-enrolled farmers, about 50 percent, 75 percent and 88 percent in Sindhanur, Shirahatti and Naragund respectively are aware of the PMFBY. It should be noted that we observed that PACS work closely with farmers to get them enrolled in the PMFBY, such that they had taken measures to pay the premium amount from their own accounts to prevent non-enrolment of farmers due to financial constraints in the enrolment period. An important observation is that the farmers are aware of crop insurance but not necessarily the specific name of the scheme. The question put forth to the respondents was 'Are you aware of the Pradhan Mantri Fasal Bima Yojana?' which could have led them to answer 'No' in this instance.

Figure 8.3: Status of general awareness about PMFBY



Source: Primary Survey Data

Note: the proportion for the enrolled farmers is derived by taking the number of enrolled farmer who reported to be aware of PMFBY and divided by the total number of enrolled farmers in a particular taluk.

Similar to awareness of other schemes in India, the higher percentage of general awareness of the PMFBY does not translate to awareness of the specific features of the scheme. Only 49 and 23 percent of the enrolled farmers in Haliyal and Sindhanur respectively were able to answer the correct premium rate of 2 and 1.5 percent charged to farmers in the *Kharif* and *Rabi* seasons. None of the enrolled and non-enrolled farmers were able to answer the correct premium rate in Shirahatti and Naragund (Annexure Table 13.64). Only 46 percent of enrolled farmers in Haliyal were able to report the correct last date for applications to be submitted to be covered under the PMFBY for the *kharif* season. In Sindhanur, only about eight and three percent of enrolled and non-enrolled farmers and in Shirahatti, about 49 and 18 percent of enrolled and non-enrolled farmers reported the correct date of submission respectively.

Interesting, a higher number of non-enrolled farmers (29 percent) compared to enrolled farmers (17 percent) reported the correct date of submission in Naragund.

Nevertheless, most farmers reported correctly that only notified crops would be covered under the PMFBY scheme in all four taluks (Annexure: Figure 13.6). In terms of risk coverage faced by farmers, the responses of farmers observed were predominantly about weather-related risks, such as drought, deficit rainfall, dry spells, pests, unseasonal rains, and floods. While about 95 percent of farmers have reported at least one risk covered under the PMFBY in Shirahatti and Naragund, more than 50 percent of the responses include drought as one of the risks covered. It is possible that farmers' responses are influenced by their own experiences, especially given the drought situation in recent years. The farmers are, however, aware of the stages during which, should they face agriculture risks, they are covered under PMFBY, but that does not translate into utilisation of the entire coverage offered under PMFBY. If the farmers are not aware of stages of post-harvest and local calamities, then they may not follow the required procedures to be eligible for claim settlement when they experience losses during these stages. In essence, the lack of awareness of crucial aspects of the scheme such as submission date, premium rate, types of risks and different stages of cultivation covered under the PMFBY may have a negative correlation with the perception of the value and trust in the scheme itself.

Place of enrolment, document submission and verification:

Following the source of information, the place of enrolment is entirely at PACS and banks for farmers in Haliyal and Naragund, whereas in Sindhanur and Shirahatti farmers submitted the documents at the local bank branch. The proposal form which is expected to be filled duly by the farmer was submitted by only eight percent of respondents in Haliyal, less than one percent in Sindhanur and zero percent in Shirahatti and Naragund taluks. The duly filled proposal form is the primary document where inaccurate information can be grounds for rejection. The fact that only less than ten percent of farmers at best had filled and submitted it raises questions about the awareness/understanding of farmers of the fine print of the crop insurance scheme for which that they are paying premiums.

With respect to document verification, about 75 percent of the enrolled farmers in all the four taluks trust that the insurance/bank officials would verify the document or are not entirely certain of any verification process. Only in Shirahatti and Naragund, about less than seven percent of farmers had reported visits by government/insurance officials to the farm to verify the crop grown and other details. In essence, there exists information asymmetry about the steps involved in the verification process and its impact on acceptance or rejection of the proposal submitted. Unless this is resolved, the probability of rejection remains high.[38] In addition, this can lead to an increase in adverse selection or moral hazard problems as the farmers can interpret it as the absence of monitoring mechanisms.

[38]Refer to Annexure Table 13.69 for more details on document submission and verification.

Understanding the determinants of enrolment and willingness to enrol in the next season:

In this section, we discuss the estimation strategy to be adopted to (a) understand the factors associated with the observed adoption of crop insurance for paddy and *jowar* crops by farmers during *Kharif* and *Rabi* 2016 respectively; and (b) estimate the willingness to adopt crop insurance for the following season. To begin with, we make certain assumptions about the farmers' risk preferences and decision-making to either take or not to take crop insurance. We assume that all farmers in our study state are risk averse in general. While the theory on decision-making under uncertainty postulates that risk preferences varies by individual, the experiments on risk preferences of farmers with regards to agricultural decisions undertaken by Binswager (1980) and continued by others establish that farmers are risk averse in general. The only matter of debate is then the degree of risk aversion of farmers. In Karnataka, farmers have been experiencing drought situations for the last three years. As a seventy-year old farmer put it "Last year (2016) was the worst drought situation that I have experienced in my lifetime". This could have heightened the production uncertainty for farmers resulting in extreme (or moderate, at any rate) levels of risk aversion, evidenced in our analysis of risks faced by farmers. We assume that farmers are similar in their risk preference and will make similar decisions related to their agricultural activity. Assuming that farmers' risk preferences are similar, we postulate that the decision to take up crop insurance will be explained by observable factors such as gender, education status, number of working household members, indebtedness and access to formal credit institutions.

Further, the access to the insurance product can vary by individual even though the scheme is implemented across all districts in Karnataka. To elaborate, a farmer who wants to avail the insurance product has to submit a proposal document to the nearest bank branch, commercial or regional rural bank, or authorised channel partner or insurance intermediaries who then submit the required documents to the insurance company. In addition, all financial transactions such as premium payment and receipt of claims, in case of crop loss, are to be done through bank transactions. Thus, the submission of proposals and uptake of the insurance product varies by the presence of bank branches or insurance intermediaries.

Given this, We estimate the following equation:

$$Y_{i,j} = \alpha + \beta_1 PB_{i,j} + \beta_2 PC_{i,j} + \beta_3 X_{i,j} + \beta_4 H_{i,j} + e_{i,j} --Equation\ (5)$$

Where $Y_{i,j}$ is the outcome variable indicating uptake of insurance/willingness to enrol for crop insurance during next season (a binary choice variable); $PB_{i,j}$ represents the distance to banks and $PC_{i,j}$ represents the distance to PACS, controlling farm-related characteristics, $X_{i,j}$ is irrigation, number of milch and drought animals, and ownership of agricultural equipment and household-related characteristics; $H_{i,j}$ is caste and gender of land owners, land ownership category, type of housing, fuel sources, farmers experience and level of indebtedness; and $e_{i,j}$ is the error term. In all regressions, the standard errors are clustered at the GP level.

Table 8.9 and 8.10 provide the estimation results of selected explanatory variables to understand the factors determining the enrolment in the PMFBY and willingness to enrol in the next season. In interpreting the results, it is important to recognise that Haliyal and Sindhanur

covers farmers growing crops during the *Kharif* season and Shirahatti and Naragund covers farmers growing during the *Rabi* season. Second, the implementation of the PMFBY also varies considerably across the four taluks. Third, our descriptive analyses show that farmers across the four taluks are characteristically different. The a priori expectation is that a single factor or set of factors may not consistently and significantly influence enrolment in the PMFBY.

It is evident from Table 8.9 that disadvantaged groups (Other Backward Castes, Scheduled Castes, Scheduled Tribes and other minority groups) are less likely to enrol for the PMFBY in Haliyal and Naragund when compared with the farmers belonging to general castes. In Haliyal, farmers with secondary education and above are 23 percent more likely to enrol for PMFBY, relative to illiterates. Even those with primary education are 17 percent more likely to enrol (albeit significant only at ten percent level). The same is not true for the other three taluks, as the estimates are insignificant for Sindhanur and Naragund; and surprisingly negatively associated (about 26 percent) with enrolment for the sample in Shirahatti. Next, the Haliyal and Sindhanur sample reveals that farmers owning more than 5 hectares of land are less likely (about 30 or more percent) to enrol for PMFBY; but a positive relationship is observed for the Naragund sample. Finally, increase in loan indebtedness at the rate of 3.2 percent leads to positive likelihood of enrolment in the PMFBY. This positive relationship with level of indebtedness is also observed in the estimates for Haliyal, Sindhanur and Naragund, where the rate is about 3.2, 15.2 and 6.4 percent respectively.

Table 8.9: Regression estimates of determinants of enrolment in PMFBY

Selected Explanatory	Paddy (*Kharif* - Rainfed)	Paddy (*Kharif* - Irrigated)	*Jowar* (*Rabi* - Rainfed)	*Jowar* (*Rabi* - Irrigated)
	Haliyal	Sindhanur	Shirahatti	Naragund
Average distance to bank	-0.010 (0.033)	-0.038 (0.032)	0.101** (0.039)	-0.139 (0.102)
Average distance to PACs	-0.039 (0.029)	0.140** (0.063)	-0.150*** (0.039)	0.226 (0.170)
OBC	-0.384*** (0.081)	0.154 (0.373)	0.393 (0.298)	-0.369** (0.131)
SCs/STs/Other Backward castes	-0.381*** (0.065)	0.098 (0.496)	0.248 (0.528)	-0.168 (0.157)
Female land owners	0.080 (0.070)	0.087 (0.124)	-0.008 (0.122)	-0.060 (0.099)
Farmers owning land (2-5 hectares)	-0.384*** (0.081)	-0.019 (0.053)	0.057 (0.055)	0.018 (0.076)
Farmers owning land (more than 5 hectares)	-0.382*** (0.065)	-0.312* (0.160)	-0.0048 (0.092)	0.409** (0.183)
Primary education	0.169* (0.083)	0.106 (0.123)	-0.118* (0.069)	-0.016 (0.109)
Secondary and above	0.229** (0.100)	0.020 (0.108)	-0.262** (0.090)	-0.144 (0.111)
Number of years of farming	0.004 (0.003)	0.001 (0.004)	-0.007 (0.005)	-0.003 (0.005)
Log of indebtedness	0.032** (0.016)	0.152** (0.059)	-0.059 (0.036)	0.064** (0.029)
Equipment [Harvest - Index]	0.032* (0.016)	-0.033** (0.014)	0.004 (0.034)	-0.001 (0.028)
Equipment [sowing - Index]	0.031 (0.042)	-0.021 (0.014)	-0.027 (0.041)	-0.052*** (0.017)
Observations	5,814	25,550	11,021	7,127

Note: Other explanatory variables include type of housing, fuel sources, and number of milch and draught animals where the coefficients' are not statistically significant. Standard errors are given in the parentheses.

* p <0.10; ** p < 0.05 and *** p < 0.01.

Next, we present the estimation results of willingness to enrol in the next season in Table 8.10. The results reveal that currently enrolled farmers are more likely to enrol for the PMFBY in the next season as well, except for enrolled farmers in Naragund, (56, 45 and 18 percent in Haliyal, Sindhanur and Shirahatti respectively). This indicates that there is higher probability for sustained enrolment in the PMFBY. In Haliyal, farmers in closer proximity to PACs are more likely to enrol for the PMFBY whereas the probability of enrolment increases by 5 percent with a kilometre increase in distance to banks. This negative relationship between distance to banks and willingness to enrolment in the next season may be in contrast to the evidence that higher level of inclusion with formal financial institutions can lead to higher demand for insurance (Bryan, 2010). But this effect could be either due to (a) accessibility to banks improving accessibility to loans which in turn potentially act as a substitute to crop insurance schemes or (b) qualitative observations suggest that bank officials do facilitate processing loans without invoking the mandatory component of enrolment in the PMFBY. The loans disbursed by banks in general can be of higher amount relative to the three lakh (3,00,000) limit at PACs. The same factors do not appear to be significant in other three taluks. Further, other factors such as education, caste, gender and farming experience do not appear to be significant at either one or five percent level.

Table 8.10: Regression estimates of willingness to enrol with PMFBY in the next season

Selected Explanatory	Paddy (*Kharif* - Rainfed)	Paddy (*Kharif* - Irrigated)	*Jowar* (*Rabi* - Rainfed)	*Jowar* (*Rabi* - Irrigated)
	Haliyal	Sindhanur	Shirahatti	Naragund
Enrolled farmer [2016]	0.558*** (0.073)	0.453*** (0.104)	0.185*** (0.055)	0.093 (0.109)
Average distance to bank	0.046*** (0.014)	0.004 (0.012)	-0.018 (0.019)	0.059 (0.054)
Average distance to PACs	-0.36** (0.017)	-0.044 (0.032)	0.008 (0.016)	-0.113 (0.098)
Female land owner	0.011 (0.081)	-0.034 (0.054)	0.067 (0.063)	-0.091 (0.071)
Farmers owning land (2-5 hectares)	-0.069 (0.078)	-0.040 (0.057)	-0.083 (0.0600)	-0.059 (0.050)
Farmers owning land (more than 5 hectares)	-0.312 (0.094)	-0.068 (0.064)	0.064 (0.098)	0.162 (0.139)
Primary education	-0.121* (0.065)	-0.040 (0.057)	-0.005 (0.090)	0.134 (0.109)
Secondary and above	-0.099 (0.072)	-0.067 (0.064)	-0.056 (0.096)	-0.065 (0.076)
Number of years of farming	0.004 (0.003)	0.004 (0.002)	0.005* (0.003)	0.001 (0.002)
Log of indebtedness	0.010 (0.017)	0.033 (0.040)	-0.004 (0.018)	0.019 (0.024)
Equipment [Harvest - Index]	-0.042 (0.049)	-0.003 (0.018)	-0.024 (0.027)	-0.036 (0.031)
Equipment[sowing - Index]	-0.123 (0.085)	0.036 (0.019)	-0.011 (0.023)	0.020 (0.015)
Observations	6,502	25,550	10,328	7,127

Note: Other explanatory variables include type of housing, fuel sources, and number of milch and draught animals where the coefficients' are not statistically significant. Standard Errors are given in the parentheses.

* p <0.10; ** p < 0.05 and *** p < 0.01.

Additionally, we estimated both the models assuming that similar risk preferences do not hold. This is because a farmer who is more risk averse may choose to visit the bank branches or insurance intermediary, irrespective of the distance.[39] This may introduce the problem of endogeneity as we do not explicitly control for this in our estimation model. Given that, we instrument the bank branches or insurance intermediary with the rainfall departure at the sub-taluk level as exogenous in nature to avoid the problem of endogeneity due to omitted variable bias. It is assumed that the bank branch coverage/PACS (Primary Agriculture Cooperative) in a particular area depends on the level of economic activity, which is to say that the density of bank branches will be higher in geographical areas with higher level of economic activity. In our case, agriculture is the primary occupation of the population thus agricultural productivity determines the level of economic activity. Agricultural productivity in turn is dependent on rainfall, especially given the successive droughts in recent years in Karnataka. Thus, it was assumed that areas with good rainfall will have higher bank branch/PACs coverage (more branches and also shorter distances to a bank branch or intermediary) to increase access to financial products.

The first stage regression estimates reveal a negative association between rainfall departure and average distance to financial intermediary overall (Annexure Table 13:74). Given that actual rainfall is lower than the expected, this translates to higher negative departure in rainfall associated with greater distance to the insurance intermediary and vice versa. This is as expected, indicating that the intuition behind our identification strategy is valid. Now, the association is statistically significant for Sindhanur and Shirahatti at one percent level (and significant at 14 percent for the Haliyal sample). Under the conventional rule of statistical significance at 1 and 5 percent, the instrument (rainfall departure) does not explain the distance to the insurance intermediary for the Haliyal and Naragund samples. Therefore, the instrumental variable estimates for Haliyal and Naragund should be interpreted with caution as they may be biased.[40]

The estimation results (Table 8.11) indicate that none of the factors such as caste, education, years of farming experience, type of farmers (in terms of land ownership), indebtedness, formal agriculture training and others have significant influence over the enrolment of farmers in the PMFBY. In Haliyal, the average distance to insurance intermediaries is inversely associated with the enrolment suggesting that higher proximity of these PACs leads to higher probability of adopting insurance. In Sindhanur, a unit increase in the index score of harvest-related agricultural equipment (thresher, harvester, and other machinery in general) reduces the probability of enrolment by 11.2 percent.

[39]It should be noted that this has to be considered with caution as our primary results indicate that majority of sample farmers only visit banks / PACs when necessary.

[40] With respect to validity of the instrument, we have not undertaken a test in our instrumental - probit setup, as the current literature is developed only to test the strength of the instruments for linear models.

Table 8.11: Instrumental variable regression estimates of determinants of enrolment in PMFBY

Selected explanatory	Paddy (*Kharif* - rainfed)	Paddy (*Kharif* - irrigated)	*Jowar* (*Rabi* - rainfed)	Jowar (*Rabi* - irrigated)
	Haliyal	Sindhanur	Shirahatti	Naragund
Average distance to insurance intermediaries	-0.425*** (0.047)	-0.007 (0.130)	-0.000 (0.087)	-0.403 (0.303)
Female land owners	0.152 (0.299)	0.021 (0.412)	0.154 (0.378)	-0.257 (0.386)
Farmers owning land (2-5 hectares)	0.382 (0.528)	0.196 (0.299)	0.119 (0.197)	-0.186 (0.331)
Farmers owning land (more than 5 hectares)		-0.480 (0.776)	-0.095 (0.351)	1.100 (1.321)
Primary education	0.196 (0.318)	0.110 (0.421)	-0.204 (0.271)	0.146 (0.415)
Secondary and above	0.424 (0.672)	-0.079 (0.316)	-0.531 (0.433)	-0.232 (0.610)
Number of years of farming	0.017* (0.010)	-0.000 (0.013)	-0.014 (0.016)	-0.012 (0.008)
Log of indebtedness	-0.003 (0.149)	0.276 (0.278)	-0.161 (0.102)	0.164 (0.262)
Equipment [Harvest - Index]	-0.042 (0.117)	-0.112*** (0.030)	0.001 (0.105)	-0.009 (0.064)
Equipment[sowing - Index]	0.181 (0.146)	-0.089* (0.045)	-0.156 (0.114)	-0.102 (0.197)
Observations	5,814	25,550	11,021	7,127

Source: Primary Survey Data

Note: * p <0.10; ** p < 0.05 and *** p < 0.01. Other explanatory variables include type of housing, fuel sources, and number of milch and draught animals where the coefficients' are not statistically significant. Standard Errors are given in the parentheses.

With respect to regression on willingness to enrol in the next season[41](Table 8.12), currently enrolled farmers are more likely to enrol for the PMFBY in the next season as well, except for enrolled farmers in Naragund, (282, 174 and 106 percent in Haliyal, Sindhanur and Shirahatti respectively). This indicates that there is higher probability for sustained enrolment in the PMFBY. In Haliyal and Sindhanur, the number of years of farming also positively influences the

[41]The first stage regression (Annexure Table 13.75) results indicate that a negative association between rainfall departure and average distance to financial intermediary overall. Given that actual rainfall is lower than the expected, this translates to higher negative departure in rainfall associated with greater distance to the insurance intermediary and vice versa. This is as expected thereby indicating that the intuition behind our identification strategy is valid. Now, the association is statistically significant for Sindhanur and Shirahatti at one percent level (and significant at 20 percent for the Haliyal sample). Under the conventional rule of statistical significance of 1 and 5 percent, the instrument (rainfall departure) does not explain the distance to the insurance intermediary for the Haliyal and Naragund samples. Therefore, the instrumental variable estimates for Haliyal and Naragund should be interpreted with caution as it may be biased, if one holds that there exists omitted variable bias since risk-taking nature of farmers have not been controlled for in the regressions. With respect to validity of the instrument, we have not undertaken a test in our instrumental - probit setup, as the current literature is developed only to test the strength of the instruments for linear models.

willingness to enrol in the next season although the magnitude is about 3.5 percent (at ten percent) and 1.7 percent (at five percent) respectively.

Table 8.12: Instrumental variable regression estimates of willingness to enrol with PMFBY in the next season

Selected Explanatory	Paddy (*Kharif* - rainfed)	Paddy (*Kharif* - irrigated)	*Jowar* (*Rabi* - rainfed)	*Jowar* (*Rabi* - irrigated)
	Haliyal	Sindhanur	Shirahatti	Naragund
Enrolled farmer [2016]	2.829* (1.490)	1.738** (0.754)	1.06*** (0.302)	0.160 (0.507)
Average distance to insurance intermediaries	-0.129 (0.225)	-0.081 (0.083)	-0.065 (0.043)	0.402* (0.197)
Female land owners	0.528 (0.575)	-0.031 (0.277)	0.388 (0.364)	0.102 (0.341)
Farmers owning land (2-5 hectares)	-0.425 (0.438)	-0.462 (0.346)	-0.498 (0.330)	0.158 (0.378)
Farmers owning land (more than 5 hectares)	-1.514 (0.730)	-0.066 (0.575)	0.395 (0.541)	-0.480 (1.064)
Primary education	-0.734 (0.432)	-0.093 (0.232)	-0.075 (0.495)	-0.040 (0.759)
Secondary and above	-0.586 (0.397)	-0.221 (0.253)	-0.364 (0.541)	0.016 (0.347)
Number of years of farming	0.035* (0.018)	0.017** (0.008)	0.029 (0.017)	0.010 (0.006)
Log of indebtedness	-0.059 (0.119)	0.201 (0.187)	-0.036 (0.103)	-0.060 (0.146)
Equipment [Harvest - Index]	-0.060 (0.616)	0.159* (0.090)	-0.146 (0.167)	-0.010 (0.080)
Equipment [Sowing - Index]	0.158 (0.304)	-0.005 (0.079)	-0.064 (0.130)	0.057 (0.034)
Observations	6,502	25,550	10,328	7,127

Source: Primary Survey Data

Note: * p <0.10; ** p < 0.05 and *** p < 0.01. Other explanatory variables include type of housing, fuel sources, and number of milch and draught animals where the coefficients' are not statistically significant. Standard Errors are given in the parentheses.

Motivation to enrol for PMFBY in the next season

The primary reasons behind enrolled farmers' willingness to enrol for the PMFBY in the next season include crop failure due to weather changes and coverage of risks at multiple stages. The coverage of risks during sowing and standing crop were specifically reported as attractive features of the PMFBY in Sindhanur, Shirahatti and Naragund. Another feature that was considered attractive, especially by small and medium farmers, is the lower premium rate which is set at two per cent during *Kharif* season in Haliyal. Surprisingly, critical aspects identified in the extant literature such as trust in intermediaries, adoption of technology, flexibility in terms of

document required or submission date, transparency in estimation of yield, calculation of claims and duration of claim settlement were not identified by farmers as primary motivations. The farmers' responses are in alignment with the risks they face thereby offering insights into what features of the scheme are assimilated by them and what features need more emphasis and follow up to enhance their experience, trust and value of the product.

Table 8.13: Motivations to enrol for the PMFBY in the next season

Haliyal	Sindhanur	Shirahatti	Naragund
Lower premium (29%), coverage of crop failure due to weather-based factors (19%), coverage of risk at multiple stages (11%)	Coverage of risk at multiple stages (17%), clarity of sum insured (16%); coverage of risk at standing crop stage (10%); more coverage of crops (8%)	Coverage of crop failure due to weather-based factors (27%); Coverage of risk at multiple stages (17%), Coverage of risk at sowing stage (16%),	Coverage of risk at multiple stages (24%); Coverage of crop failure due to weather-based factors (18%), Coverage of risk at sowing stage (13%); Coverage of risk at standing crop stage (9%), Coverage of risk due to local calamity (9%)

Source: Primary Survey Data

Note: The percentages were derived by dividing the total responses (including multiple responses) by farmers.

Understanding Basis Risk:

We make use of threshold yield and average yield of paddy (in kilograms per hectare) provided by the DoA, GoK. The average yield estimated through CCE is available only for the *Kharif* season. Therefore, the analysis is limited to the GPs selected for survey in Haliyal and Sindhanur taluks. Following Jensen et al (2014), we define covariate risk as the average losses reported by the farmer at a particular IU level (gram panchayat) during *Kharif* 2016[42]; and the remainder of the average losses is defined as idiosyncratic loss specific to each farmer in that IU during *Kharif* 2016. The basis error is defined as the difference between the losses in yield reported by the farmer and by the index value (threshold - average yield). The positive value of basis error indicates that the losses experienced by the farmer are more than the losses covered by the insurance scheme - false negatives. The negative value indicates that the loss experienced by farmers is less than the losses covered by the insurance scheme - false positives. The variance of basis error is often defined as basis risk.

[42] It should be noted that we make use of losses reported by the farmers themselves for estimating the covariate and idiosyncratic risk. These self-reported values may contain an upward bias as farmers may have reported a higher value to avail claim settlements.

In Haliyal, the average difference between threshold and average yield is about 70.25 percent which translates to estimated loss of 1,828 kg per hectare. The deviation is more than 50 percent in all the 13 GPs, even reaching about 90 percent in two GPs. While the severe drought during *Kharif* 2016 can be attributed to the low average yield, the huge deviation still raises questions about the reliability of threshold and average yields in predicting losses at the IU level. In this case, the high threshold yield increases the probability of false positives where individual losses are lesser than estimated area losses. This can have a perverse effect on resource allocation at the household level. An examination of the basis error reveals that the insurance doesn't identically cover all the losses experienced by farmers. This loss not covered by the crop insurance scheme is higher for farmers in GPs, namely Badakanashirada, Chibbalgeri, Janaga, Kesarolli, Tatwanagi, and Yadoga in Haliyal. The higher uncovered component, or the basis error, reduces the incentive for farmers residing in these GPs to enrol for the PMFBY.

Table 8.14: Threshold and average yields and basis error in Haliyal

Gram panchayat	Threshold yield (in kgs per hectare)	Average yield (in kgs per hectare)	Difference between threshold and average yield	Difference (%)	Average basis error
Alur	2,693	560	2,133	79.20	205
Ambikanagar	2,551	272	2,279	89.33	458
Arlawada	2,895	1,049	1,846	63.77	980
Badakanashirada	2,429	1,208	1,221	50.26	1,362
Bhagavati	2,348	732	1,617	68.83	643
Chibbalageri	2,520	1,102	1,418	56.27	1,419
Janaga	2,417	808	1,609	66.55	1,169
kesarolli	2,705	791	1,913	70.74	948
Nagashettikoppa	2,862	232	2,630	91.89	113
Sambrani	2,982	902	2,081	69.77	550
Tattigeri	2,551	843	1,709	66.98	695
Tatwanagi	2,257	425	1,832	81.16	1,137
Yadoga	2,526	1,047	1,479	58.56	1,090
Average			**1,828**	**70.25**	**828**

Source: Department of Agriculture, Government of Karnataka

Note: The data was not available for Ambewadi GP, therefore not included.

In Sindhanur, the average difference between threshold and average yields indicate that there are no losses and therefore no claim settlements, except for enrolled farmers in the Pagadaddinni and Virupapur GPs. But examination of basis error reveals a significantly higher amount of losses experienced by farmers not covered by the crop insurance scheme. The average basis error for these 12 GPs is about 2,388 kgs per hectare, indicative of the higher uncovered component which farmers have to bear despite enrolling with the PMFBY. This false negative has greater implications for the uptake of the PMFBY and as it is not clear whether the individual farmer is actually reducing risk by paying premiums for crop insurance. In sum, the

analysis suggests that it is important to reduce the magnitude of basis error to ensure that the farmers are able to cope with the crop loss resulting due to risks covered under the PMFBY.

Table 8.15: Threshold and average yields and basis error in Sindhanur

Gram Panchayat	Threshold yield (in kgs per hectare)	Average yield (in kgs per hectare)	Difference between threshold and average yield	Difference (%)	Average basis error
Badarli	5,571	7,052	-1,481	-26.58	1,491
Bappur	5,224	7,307	-2,083	-39.87	1,545
Chennalli	6,186	7,202	-1,016	-16.43	2,779
Gunjalli	5,505	6,826	-1,321	-24.00	3,349
Madasirwar	4,629	5,451	-822	-17.76	2,991
Pagadadinni	6,031	5,924	107	1.78	939
Somlapur	5,305	6,684	-1,379	-25.99	2,608
Tidigol	5,829	6,816	-988	-16.94	2,823
Udabal	5,649	8,556	-2,907	-51.46	4,118
Valaballary	6,155	8,079	-1,924	-31.26	1,506
Virupapur	5,803	4,884	919	15.84	2,168
Yelekudlagi	5,435	7,027	-1,591	-29.28	2,341
Average			-1,207	-21.83	2,388

Source: Threshold and average yields provided by the DoA, GoK

Note: The data was not available for Gonwar GP which is not included in the analysis here.

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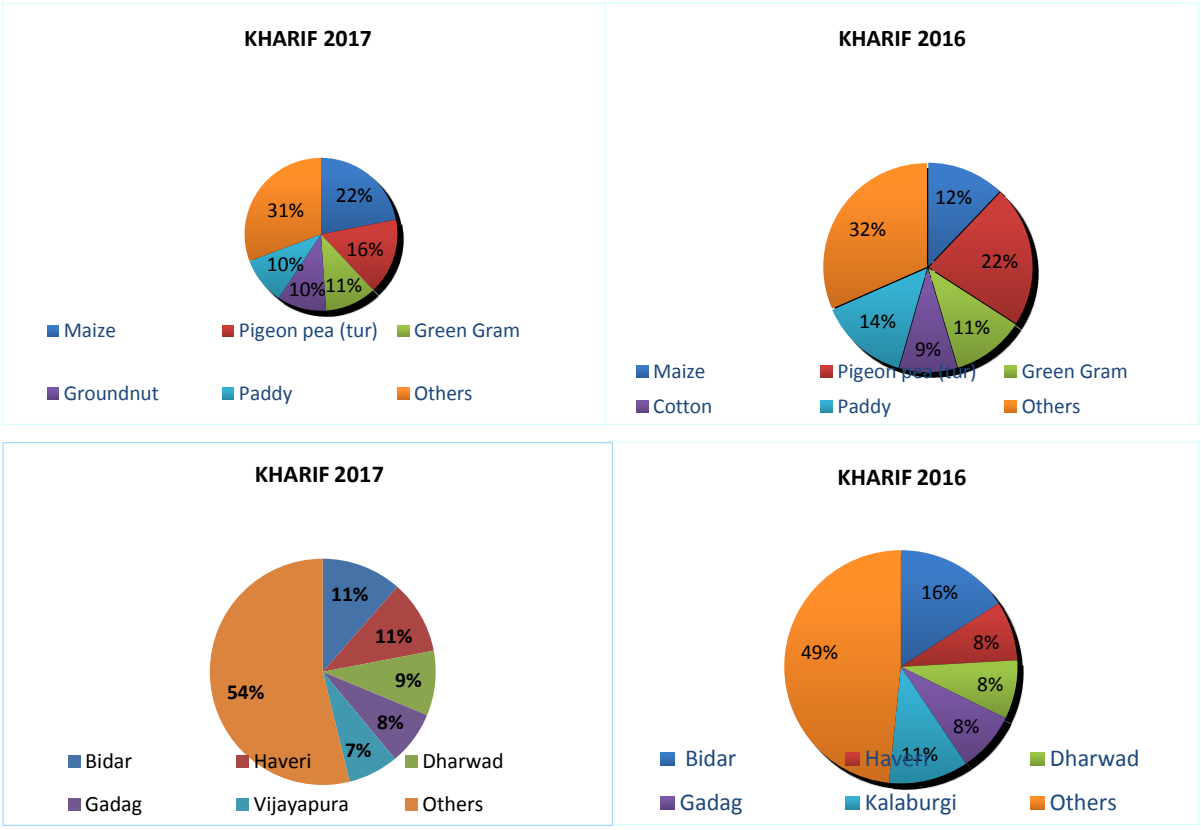
8.4 Current Status of the PMFBY and measures adopted by the DoA

The chart below provides a high-level snapshot of both crop-wise and district-wise coverage of the PMFBY for the current *Kharif* 2017 season. Maize, *tur dal*, green gram, groundnut and paddy continue to be the most insured crops in the *Kharif* season. Only five northern districts of Karnataka (comprising 30 districts) account for close to 50% of the total insured crop area in the *Kharif* season. This is a reflection of the anticipation of harsher drought conditions in the northern districts of Karnataka.

Figure 8.4: Top five crops and top five districts under PMFBY (based on insured crop area)



Source: *Samrakshane* Crop Insurance Portal

However, our survey findings reveal that there are serious gaps in implementation of the PMFBY, especially lack of information at the IU level (Annexure: Table 13.93-13.96) and basis risk. The DoA, GoK, has already undertaken several measures for improving the implementation of the PMFBY. These measures are discussed below:

Crop area estimation:

Currently, there is a mechanism of reconciliation of crop sown area statistics done at the taluk and district levels. However, updating the crop sown statistics by using a mobile app (RTC App) that enables the village accountant to go to each field and update the crop statistics is planned. This in turn would enable automatic enumeration of crop-wise sown statistics and the estimation of production statistics and this reconciliation exercise could be done away with. This would also help in the improving the randomisation of CCEs for each of the crop based on the area under cultivation. Currently, random numbers are generated and the plots are visited to check whether or not the notified crop is being grown. In case it is not being grown, another plot is randomly

selected. In the event of the accurate crop sown area estimation through RTC app, the randomisation would happen within the cropped areas of a particular crop.

Smart sampling of CCEs:

Currently, the CCEs for every crop are same and the two plots adjacent to each other (and homogenous in many ways) but belonging to different GPs may have chances of getting different compensations or one may get compensation while the other may be denied it for crop loss. The adoption and usage of innovative technologies (such as RST, drones, GIS and smart phones) is an important feature of the PMFBY. It has been reasonably proven that satellite imagery can help in demarcating the cropped areas into clusters on the basis of crop health. This can help in the 'smart sampling' of CCEs. This minimises the total CCEs needed by about 30-40%. In some instances, when the area insured is much more than the total sown area of the crop resulting in reduction of sum insured and consequently reduction in claims of farmers. RST/satellite imagery can also be used to minimise these sorts of area discrepancies. Research is also ongoing to establish a strong correlation between yield estimates predicted by RST/satellite image-based computational models and actual yield estimates through CCEs. In the long term, state governments and insurance companies may use these models to directly estimate crop yields at the IU level, subject to both parties being satisfied with the prediction accuracy to service the claims.

Sorting out the glitches in implementation:

While the first year of implementation had issues, many of them are being addressed and changes have been made in the bidding process, notification, enrolment, and claims settlement. One of the important issues was the delay in the settlement of claims. The steps like use of mobile app to conduct all the CCEs (*Kharif* 2016 CCEs were 60% manual and 40% app based) has hastened the process of the estimation of crop yields. Similarly, clear deadlines have been imposed on insurance companies for contesting the yield or CCE data (three days if the CCEs were witnessed by insurance companies and seven days if the insurance companies have not witnessed the CCEs). The mobile app is modified to record the CCEs of multi-picking crops like cotton. The CCE calendar is shared with the insurance companies through the mobile app.

8.5 Budget analysis of the Government of Karnataka

This helps to understand the extent of public expenditure incurred for providing crop insurance cover to the farmers. It will also serve as a backgrounder by providing an overview of different public expenditures targeted towards the welfare of farmers critical in understanding the uptake of the PMFBY in the state. It is necessary to be clear that the PMFBY is operating in an environment where farmers are impacted by various types of input subsides, support price mechanisms and schemes promoting improved packages of practices for crop cultivation. Therefore, the perception and assessment of risk by the farmers and their assumption of the role of the government is also influenced by these factors.

The state through its DoA, Departments of Horticulture, Sericulture, Co-operation and the Agricultural Marketing Board, has been incurring various forms of expenditure that are targeted towards the farmers. These expenditures include:

- subsidies towards different inputs to agricultural production (seeds, fertilisers etc.)

- schemes aimed at improving the production and productivity which carry subsidies for adopting improved practices (use of improved agriculture machinery, micro irrigation)
- provision of credit at lower interest rates, incentive for milk production and ex-gratia for death of farm animals in case they are not insured
- indirect subsidies such as power, food and housing, minimum floor price procurement and loan waivers (if any)

Provision of inputs like seeds and fertilisers:

While the breeder seeds are produced by the Indian Council of Agricultural Research (ICAR) institutes and agricultural universities, the certified seeds are produced by National Seeds Corporation, Karnataka State Seeds Corporation, Karnataka Co-operative Oilseeds Growers Federation and private agencies using the breeder seeds. Certified seeds were produced for 14 crops[43] in *Kharif* (1.72 lakh quintals) and sold at subsidised rates for 15 lakh farmers. Similarly, during the *Rabi* season, certified seeds were produced 12 crops (1.72 lakh quintals) and were sold at subsidised rates for 3.59 lakh farmers. The amount of subsidy spent during 2016-17 was Rs 7909 lakh and Rs 4210 lakh in the *Kharif* and *Rabi* seasons respectively. Fertiliser is also supplied by the government at subsidised rates. The requirement of different grades of fertilisers (nitrogenous, phosphorus and potash) for the year 2016-17 for the *Kharif* and *Rabi* seasons was estimated at 21.75 lakh tons and 15.5 lakh tons respectively. The Karnataka State Co-operative Marketing Federation ensures timely supply and availability at district and taluk levels by maintaining buffer stock of these fertilisers. Around 17.5 lakh tons of NPK fertilisers are utilised in farm production annually in the last four years.

Schemes:

While certain schemes are universal, others are applicable to certain geographical areas. The farmer has to apply to avail the benefit of the schemes. The National Food Security Mission (NFSM), the National Mission on Oilseeds and Oil palm (NMOOP), the National Mission for Sustainable Agriculture (NMSA) and Krishi Bhagya are some of the schemes specific to certain areas. Schemes like Rashtriya Krishi Vikas Yojana (RKVY) and the micro irrigation scheme are universal throughout the state.

Krishi Bhagya: This scheme, started in 2014-15, is aimed at improving the production and productivity in the dry zones of Karnataka. A total of 105 taluks in 23 districts have been covered under this scheme. Construction of farm ponds, diesel generators for lifting of the water from farm ponds, micro-irrigation facilities (drip/sprinkler set up), farm machinery are offered for rent at subsidised rates, construction of poly houses are encouraged. Blocks/taluks with the lowest rainfall are selected and preference is given for small, marginal farmers belonging to SC and ST categories. The subsidy for SC and ST is 90% while for others, it is 80%. The scheme is tied to ensure adoption of improved agricultural practices such as soil testing, use of improved seeds and varieties, judicial use of fertilisers and water resources. This scheme also has components for improving animal husbandry and horticulture as well.

[43]Paddy, *ragi*, *jowar*, maize, *bajra*, *navane*, cowpea, green gram, black gram, red gram, groundnut, sunflower, soyabean and cotton.

GoI-sponsored schemes such as RKVY, the Pradhan Mantri Krishi Sinchai Yojana (PMKSY), the Micro Irrigation scheme and the Soil Health Management scheme have been implemented by GoK. RKVY has multiple objectives and offers flexibility for states to tailor schemes to their requirements. Bhoochetana, the soil health card, which involves soil testing and recommending crops and fertiliser doses is part of it. Similarly, the micro irrigation scheme and farm mechanisation are also part of the RKVY. An amount of INR 234 crore has been allocated for year 2016-17. NFSM focuses on farm-level demonstration by subsidising the entire package of practices. New farming techniques, application of inputs, post-harvesting techniques are introduced. About 100 hectares in each of the sub taluk/*hobli* is targeted in the core production areas. Rice, pulses and coarse cereals are covered in this scheme. An amount of INR 222 crore has been allocated for the year 2016-17. The National Mission on Sustainable Agriculture focuses on use of micro irrigation, rainfed area development and organic farming technologies. Similarly, the mission on oilseeds and micro irrigation focuses on the improving the production of oilseeds and water productivity respectively. GoK has been effectively using the technology to implement most schemes. Geo-tagging of the farm interventions and transfer of monies to accounts of farmers directly (according to the stage-wise progress of the implementation of scheme) are followed stringently.

Apart from these schemes through which farmers become beneficiaries and farm land gets improved, incentives like provision of credit at lower rates is critical and universally available for all farmers. GoI (through commercial and regional, rural banks) provides SAOLs or crop loans at 7% per annum. This is further subsidised for farmers who pay it back in time to an extent of three per cent thus making it four per cent effective interest. GoK has been providing an additional 1% interest rate subvention and thus making it three per cent effective interest rate for crop loans from commercial banks and RRBs. GoK also provide crop loans at 0% (up to INR 3 lakhs) and term loans up to INR 10 lakhs at 3% interest through farmer co-operatives (PACs). GoK also provides incentive for milk production at INR four a litre. Subsidies are provided to farmers for formation of cattle units, sheep and goat units, as well as poultry units. The subsidy is 25% for non SC/ST and 75% for SC/ST farmers. An ex-gratia for death of animals which are not insured is also provided.

Table 8.16: Subsidies, loan waivers and drought relief provided by GoK

Description	2013-14 AE	2014-15 AE	2015-16 AE	2016-17 RE	2017-18 BE
Subsidies (power, food and housing) INR in crores	16329	15334	19164	18616	
Loan waiver (INR in crores)					8165
Drought relief (INR in crores)			1540.2[44]	795[45]	

Source: Government of Karnataka

[44] http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/rs-1540-crore-drought-relief-for-belagavi/article8333758.ece

[45] http://timesofindia.indiatimes.com/business/india-business/centre-approves-rs-795-cr-drought-assistance-to-ktaka/articleshow/59367394.cms

Farmers enjoy free power supply (though it is erratic, with unscheduled power cuts) for irrigation purposes and this is subsidised by the government and the subsidy goes to power supply companies. Similarly, the subsidy on supply of free ration (Anna Bhagya) for BPL families and subsidy for housing also reach the farming community in significant manner. Farmers also benefit from loan waivers and drought relief at times of severe distress (Table 8.16).

The Minimum Floor Price (MFP) is the price at which the government steps in to the market to avoid further price fall and procures the farm produce to ensure returns to the farmer. A revolving fund is set up which is administered by the Karnataka State Agricultural Marketing Board for which the government and the Agriculture Produce Cooperative Marketing Committees across the state contribute regularly. The Board enters the market and procures the produce in the event of prices falling below the MFP indicated every year. During 2016-17, paddy, *ragi*, *jowar*, coconut and onion were procured by the Board by entering into the market. An amount of INR 637 crores was spent in procuring 36.86 quintals of produce.

Budget analysis:

The Demand for Grants (01 Demand) presented before the legislature for the DoA and the Departments of Horticulture and Sericulture is analysed for the last five years. About 720 line items of budget were scanned and are classified into broad categories.

Table 8.17: Expenditure of DoA, Departments of Horticulture and Sericulture (INR in lakhs)

Description	**2013-14 AE**	**2014-15 AE**	**2015-16 AE**	**2016-17 RE**	**2017-18 BE**
	NIAS/MNAIS/WBCIS			**PMFBY/WBCIS**	
Crop Insurance	13974	8434	9880	67538	84511
Department costs (Salary+ maintenance + transport + office expenses)	133228	167238	179905	170541	160687
Financial assistance/relief	1884	1526	511	7400	7676
Input subsidies	45978	30782	21149	160355	182051
Misc(Departmental transfers)	0	-537	-947	-2228	-5151
Scheme (RKVY, MI, Krishi Bhagya,etc)	151770	242386	268467	159940	220733
Total	**346835**	**449828**	**478966**	**563547**	**650507**
State budget	**11064870**	**12862497**	**14250821**	**16447859**	**18656109**
CI as % of agricultural budget	**4.03**	**1.87**	**2.06**	**11.98**	**12.99**
Agricultural budget as % of total budget	**3.13**	**3.50**	**3.36**	**3.43**	**3.49**

Source: Government of Karnataka

Note: AE= Actual Expenditure RE: Revised Estimates BE: Budget Estimates

The crop insurance expenditure till 2015-16 was on actual basis or the claims settlement paid through the AIC, the public sector undertaking of the GoI. From 2016-17, because of the upfront payment of premium, the expenditure has shot up and the proportion of crop insurance expenditure has also increased to 12 percent and to 13 percent in 2017-18. The input subsidies

under micro irrigation and Krishi Bhagya have increased significantly and this has resulted in higher input subsidies to farmers.

9 Implications of study findings

9.1Implications for the intervention

Although the uptake of the PMFBY is greater than earlier crop insurance schemes of similar nature in Karnataka, it still remains much lower than the all-India average. Considering that the farmers in the state face widespread uncertainties, the potential for enhancing the uptake remains high. The GoK is highly responsive and deeply interested in improving the processes to make the scheme better suited to the needs of small and marginal farmers while also making it economically viable for insurance companies. Towards that, in consultation with the implementing department, we have identified two major interventions that could make a difference in terms of increasing the uptake and enhance the efficiency of loss estimates as well as time taken for settling the claims.

The pilot study has clearly shown the need for greater awareness of the scheme and its features among marginal and small farmers and also among the PACs and local government functionaries as they play a critical role in informing farmers and influencing the uptake. Currently, the understanding of the enrolment process, features of the area approach, their implications for eligibility for claims and other related aspects remain weak among farmers. Any intervention that improves this awareness in a systematic and cost-effective manner is likely to have a positive influence not only on the uptake but also on the process of claims and their settlement.

Another intervention that could improve the efficiency of the CCE exercise could influence the efficiency and delivery of the scheme immensely. The high level of diversity in the number of agro-climatic zones and the number and types of crops grown coupled with high percentage of small and marginal farmers in Karnataka pose a serious challenge in terms of the reliability of CCEs for providing yield estimates which are fair to farmers and acceptable to insurance companies. The high number of CCEs due to diversity causes high levels of stress on government machinery to complete the process in a timely and reliable fashion. Any intervention that helps in reducing the number of CCEs while improving the reliability and fairness of yield estimates would indeed have a very positive impact on the claim settlement process and time taken and in turn on improving the livelihood security of small and marginal farmers. In this context, the government is open to ideas and adept in the use of technology. This provides an opportunity for trying out technology-based appropriate solutions.

An improvement in the CCE exercise would benefit not only the PMFBY but also other schemes in operation, as the CCE is conducted for the purposes of estimating yields even in absence of this scheme. It could be especially helpful in the rationalisation of subsidy-based schemes in agriculture, something in which the GoK is interested.

The following includes more specific recommendations to the policy and product related to crop insurance:

Policy-related recommendations:

a. Given the complexity and enormity of tasks involved, it is believed that the local GPs can be given a central role in creating awareness, enrolment drives and providing regular information/communication about the claim application and settlement process. At the moment, there are no insurance agents at the GP level which has caused much distrust and dissatisfaction about the scheme itself. This would be prevented if the local gram panchayat is given the responsibility of implementation with the DoA and district authorities play a central role in establishing directives and goals.

b. Considering the lower participation of female landowners in PMFBY, despite the fact that operational guidelines mention the need for 'special efforts to promote their participation', it is recommended that the insurance company and its intermediaries take specific measures to step up improving their access to insurance schemes. One measure could be to work with women self-help groups such as Mahila Samakhya and Stree Sakthi in Karnataka to educate, link insurance with banking and other economic activities, and promote uptake of PMFBY.

c. For a state like Karnataka where multiple crops are grown in different seasons, it is recommended that a single approach of yield estimation either through area-based or weather-based or satellite images should not be adopted. In order to achieve scale in the short-run, it is best that a combination of approaches is used where the choice of a particular approach is determined by the trade-off between basis risk and increased coverage through trust in the insurance product. In the long run, once the necessary infrastructure is built, a slow transition to adopting a single approach across all crops during different seasons could be adopted.

d. Building infrastructure includes investing in both enhancing the technical expertise and physical infrastructure. From our discussion, we are aware that the DoAi s interested in making use of satellite imagery to (i) identify areas/plots where a notified crop is cultivated thereby transition to smart sampling process is possible and (ii) improve the accuracy of the yield estimation. It is recommended that investments be made in (i) upgrading human capital, (ii) identification of new techniques of estimation and (iii) investment in physical infrastructure (such as data management systems, better equipment and so on) to achieve both these objectives. In the short run, the DoA should invest towards operationalizing smart sampling. This will help in easy identification of areas and more accurate randomisation of plots thereby making the CCE process more efficient and robust.

e. The incorporation of smart sampling can then lead to identification of crops for which satellite imagery could be used or further developed to be able to estimate yield accurately. This in a way will facilitate in separating the crops for better-suitability to weather-based or yield-based methods. Given the evidence from literature, it is recommended that the government invests in weather stations and move towards weather-based index. In the long run, a move towards adopting satellite imagery is recommended as the weather may vary frequently and drastically due to climate change with implications for weather-based index.

f. It is recommended that not only awareness is created about the insurance product, but the rationale, modus operandi and benefits of the crop insurance is also imparted to the farmers. The objective should be to ensure that the farmers take up crop insurance in an informed manner rather than investing only in efforts to increase enrolment rates without improving the knowledge about the product. One particular method is the use of videos through mobile technology (especially social media applications) and regular/frequent screening at the GP/village level. The use of mobile technology ensures maximum reach to both the farmers and officials. However, the success of this strategy to impart knowledge needs to be better understood.

g. One of the impediments towards faster insurance payout to the farmer is the CCE results being contested by insurance companies at the time of claims settlement. To address this issue, Karnataka is piloting an initiative where they allow an insurance company representative to witness the CCE process. The primary worker records the actual yield data in the mobile app, and before transferring the data to the central server the yield data, he/she is required to authenticate the data by the representative using an OTP. In case of any dispute the representative needs to raise an objection through the mobile app itself. However, if the representative hasn't witnessed the CCE, the objection could still be raised on the portal within certain time period post the completion of CCE. If not, the CCE data is considered accepted by the insurance company. It is recommended that the Government of India considers this approach for implementation at the national level.

h. Currently, the plots for conducting CCEs are randomly assigned by the crop insurance portal database and executed through a mobile app. The primary worker (PW) responsible for conducting the CCE receives a random plot/survey number on his mobile phone and then needs to ascertain if the notified crop has been sown in that plot. If the notified crop is not sown on the randomly assigned plot, the PW needs to go to the next plot/survey number and if the notified crop hasn't been sown on that plot also, the PW needs to go to the next and this continues till the PW finds a plot that has sown the notified crop. This is a highly inefficient and cumbersome part of the process of conducting CCEs. Instead, satellite imagery/remote sensing technology can be leveraged, especially for a few selected long-standing crops (such as paddy, jowar and cotton) and selected areas/districts with low cloud cover to first arrive at a pool of plots/survey numbers that have actually sown the notified crop within a specified IU. From within this pool, plots/survey numbers can then be randomly assigned for conducting the CCEs. This would help in randomisation within only those plots/survey numbers which have actually grown the notified crop during that season, optimising the process. The usage of satellite imagery/remote sensing technology can also be further extended to intelligently sample the plots/survey numbers for conducting CCEs within an IU based on crop density [high/medium/low] to ensure that they accurately represent the crop yield within that IU. This would help in reducing the basis risk. To eventually move away from CCEs, direct crop yield estimation models (For a few major crops such as paddy, cotton and jowar in Rabi in a few selected areas) after thorough validation using manual CCE data can be developed. These models have the potential for

reducing the effort and overall time taken for crop loss assessment, thereby enhancing eh efficiency.

i. Currently, PMFBY covers only those crops for which the past yield data is available. This limits not only the coverage of crops under PMFBY but also has the potential to discourage farmers from cultivating a new crop or a new variety for which the data may not be available. It is recommended that PMFBY offers coverage, may be slightly at a higher premium -say 3 % - for new crops. This will ensure that the farmers continue to enjoy the flexibility to decide rationally about the choice of crops they want to cultivate in a particular season.

j. A timeline needs to be defined by which insurance companies are to return the premium amount to farmers whose applications have been rejected. This could be before the start date of claims settlement after which the insurance companies should be made liable to settle the claims of all such farmers whose premium amounts have not been returned.

Product-related recommendations

a. One option could be to introduce a “no-claim bonus” feature under PMFBY. A 10% no-claim bonus waiver on the farmer’s share of the premium amount for every consecutive claim-free year insured, up to a maximum of 50% could be considered. This could serve as an incentive for farmers to sustain enrolment in the scheme.

b. Currently in PMFBY, for all major crops the defined IU is a GP and CCEs are conducted in four randomly selected plots/survey number (two per village) to estimate the actual yield for that particular IU. The claims payout to all farmers within this IU/GP is based on the shortfall in yield (threshold yield – actual yield). This results in a higher basis risk since the four randomly selected plots/survey numbers may not accurately represent the actual yield across that GP. Instead rainfall data, soil health reports, historical yield data and satellite images could be used to define more homogeneous yield clusters as IUs instead of GPs. However, this definition of IUs needs to be finalised well before the cropping season.

c. It is recommended that the time line for notifying the insurance companies for localised risks and post-harvest losses is increased from 48 hours to 96 hours. The relaxation of the 48 hour time limit will provide enough time for the farmer to be able to collate all the required documents for claim applications. Second, it would also ensure that the window is not missed due to factors such as weekends/festivals/other local holidays. Finally, it is recommended that further relaxation should be reviewed and allowed in the case of extreme events.

Implications for further research

There is indeed a lot of value in carrying out a full-fledged, long-term evaluation of the scheme, especially on the basis of some specific, well-designed interventions with the potential for improving the processes of enrolment and claim settlements, which in turn will increase the uptake.

The state also offers opportunities for carrying out official data-based analysis on a regular basis and matching those with field-based evaluations because of the presence of a highly informative and interactive web-based portal, *Samrakshane*, and digitised land records in *Bhoomi* helps in understanding targeting patterns over a period of time as it allows analyses of trends in land-size, crops grown and crop insurance uptake.

The state is also trying out several institutional models in terms of involving GPs, PACs and banks to improve delivery. An exploratory study of the institutions and stakeholders, their capacities, interests and potential could help the government in carrying out the desired restructuring and reforms at various levels.

10 Major challenges and lessons learnt

The process evaluation presented a number of challenges and the experience has prepared us for carrying out the full evaluation at the next stage. The challenges faced and solutions found are listed here:

10.1 Obtaining ethical approvals from institutional review boards:

Due to time constraints, we did not obtain ethical approval from review boards. Instead, we constituted an Advisory Committee with representation from noted academics in the areas of economics, agricultural economics, quantitative research and the implementing agency. They met periodically and provided inputs not only on the research design but also discussed ethical aspects of the evaluation. For the second phase, we intend to submit the proposal for ethical review to the Board that exists at the Indian Institute of Management, Bangalore (IIMB) soon after submitting it for review and approval. This would help in obtaining the ethical approval simultaneously with funding approval.

10.2 Obtaining approvals from the relevant government departments to run the implementation and/or evaluation*:*

With some efforts in the initial phase, we obtained approvals and support from the GoK primarily due to our existing relationships and credibility. One team member was located in the implementing unit of the government and she would continue to be placed there for the next phase of evaluation as well. Another colleague also spent substantial time in both understanding and also supporting the implementing agency.

10.3 Engaging with key stakeholders at various stages of the study and data collection:

Given the support received from the implementing agency, it was not difficult to consult and engage with different stakeholders. The DoA had issued a letter of introduction and support for consultations and survey.

10.4 Monitoring and understanding the fidelity of the programme roll-out:

Positioning a colleague within the implementing agency helped in understanding the role of various stakeholders, including different departments and agencies such as insurance companies. Also, our own experience and credibility played a role in establishing relationships that in turn helped in monitoring the processes.

10.5 During data analysis and adhering to the planned timeline:

A planned timeline for this phase proved to be too tight but we could complete the analysis of the primary survey as well as of the data collected from other sources primarily because of the effective planning and collaborations with the survey agency, implementing agency and the advisory committee members.

11 Appendices

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