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Crop Insurance in India: Key Issues and Way Forward

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Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADWDRS	Agricultural Debt Waiver and Debt Relief Scheme
AIC	Agriculture Insurance Company of India Limited
ARC	Agriculture Risk Coverage
AWS	Automatic Weather Stations
CCIS	Comprehensive Crop Insurance Scheme
CCE	Crop Cutting Experiment
CHAMAN	Coordinated Horticulture Assessment and Management using geo informatics
CPIS	Coconut Palm Insurance Scheme
DACFW	Department of Agriculture, Cooperation and Farmers Welfare, GoI
DLTC	District Level Technical Committee
ESA	European Space Agency
FAA	Federal Aviation Administration
FCIC	Federal Crop Insurance Corporation
FCIP	Federal Crop Insurance Program
FCOS	Food Crops and Oilseeds
FIIS	Farm Income Insurance Scheme
F&V	Fruits and Vegetables
GPS	Global Positioning System
GoI	Government of India
IA	Implementing Agency
IASRI	Indian Agricultural Statistical Research Institute
ISRO	Indian Space Research Organisation
IRDA	Insurance Regulatory and Development Authority

LEO	Low Earth Orbits
MNAIS	Modified National Agriculture Insurance Scheme
MSP	Minimum Support Price
MPCI	Multiple Peril Crop Insurance
NAIS	National Agriculture Insurance Scheme
NCIP	Nation Crop Insurance Programme
NADAMS	National Agricultural Drought Assessment and Monitoring System
NSSO	National Sample Survey Organisation
PCICC	Peoples Crop Insurance Company of China
PLC	Price Loss Coverage
PMFBY	Pradhan Mantri Fasal Bima Yojana
RIICE	Remote sensing-based Information and Insurance for Crops in Emerging economies
RMA	Risk Management Agency
RST	Remote Sensing Technology
RUA	Reference Unit Area
RWBCIS	Restructured Weather Based Crop Insurance Scheme
RWS	Reference Weather Station
SLCCCI	State Level Co-ordination Committee on Crop Insurance
SFSA	Syngenta Foundation for Sustainable Agriculture
SoF	Scale of Finance
STAX	Stacked Income Protection Plan
UAV	Unmanned Aerial Vehicle
WBCIS	Weather Based Crop Insurance Scheme

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Abstract

Farmers in India are exposed to large agriculture risks due to vagaries of nature. One of the most effective mechanisms to mitigate agricultural risks is to have a robust insurance system. Although crop insurance has been in the country since 1972, yet it has been beset with several problems such as lack of transparency, high premium, delay in conducting crop cutting experiments and non-payment/delayed payment of claims to farmers. Realizing the limitations of existing system of crop insurance, a new crop insurance scheme was launched on Baisakhi day, Pradhan Mantri Fasal Bima Yojana (PMFBY), from Kharif 2016. Although the overall area insured has increased by a modest 6.5 percent (from 53.7 million ha in 2015-16 to 57.2 million ha in 2016-17), the number of farmers insured has increased by 20.4 percent (from 47.5 million to 57.2 million), the sum insured has increased by 74 percent (from Rs 115432.4 crore to 200618.9 crore), and premium paid has increased by 298 percent (from Rs 5491.3 crore to Rs 21882 crore) over the same period. The scheme has faced several challenges during its first year of implementation which pertain to extension of cut off dates for registration resulting in high premium rates; delay in submission of yield data to assess damages as the system relies on thousands of Crop Cutting Experiments (CCE); lack of trust in the quality of such data as they are not being video recorded and delay in payment of premium subsidy by the state governments to the insurance companies, etc. The litmus test of any crop insurance program is quick assessment of crop damages and payment of claims into farmers' accounts directly, and from that point of view, the first year of implementation of PMFBY has not been very successful.

This paper recommends use of high technology and JAM trinity by linking land records of farmers with their Aadhaar numbers and bank accounts for assessment and faster settlement of claims. A portal linking Core Banking Solution (CBS) and crop insurance is need of the hour giving information on real time basis. India's prowess in Information Technology should come handy to achieve this.

Keywords: *Agricultural Risk, Crop Insurance, India, Premium Subsidy*

JEL Classification: Q18, G22, G32

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Executive Summary

Farmers are often exposed to natural vagaries, which adversely affect their agricultural production and farm incomes. One of the most effective mechanisms to mitigate agricultural risks emanating from natural calamities is adoption of a robust insurance system. Although crop insurance has been in the country since 1972, yet it has been beset with several problems such as lack of transparency and non-payment/delayed payment to farmers. Therefore, it would be important to streamline its operation by developing an institutional mechanism that can bring greater transparency and effective implementation, particularly in terms of quick and accurate compensation to farmers for the damages incurred.

Until recently (till March 2016), there were three crop insurance schemes operating in India – National Agriculture Insurance Scheme (NAIS), Modified National Agriculture Insurance Scheme (MNAIS) and Weather Based Crop Insurance Scheme (WBCIS). The penetration of agricultural insurance was low and stagnant in terms of area insured and farmers covered. In the three year period from 2013-14 to 2015-16, the average area insured under all the schemes was 47 million hectare covering 39 million farmers. The high premium rates of 8-10 per cent under MNAIS and WBCIS, delay in settlement of claims, which took around 6 to 12 months, inadequate sum insured and their capping under MNAIS and inadequate government support in the form of premium subsidies had left a vast majority of farmers without any significant insurance coverage.

Realizing the limitations of existing system of crop insurance, the GoI launched a new crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY) from Kharif 2016. Some of the improved features of this scheme are: removal of capping on premium rates leading to higher amount of sum insured, fixing premium rates at 2 percent in Kharif season and 1.5 percent in Rabi season for farmers, leading to substantial increase in premium subsidy by the government. The use of mobile based technology, smart Crop Cutting Experiments (CCEs), digitisation of land record and linking them to farmers' account for faster assessment/settlement of claims are other steps required for effective implementation of the new crop insurance scheme.

The analysis done for the new scheme reveals that overall area insured has increased marginally by 6.5 percent (from 53.7 million ha in 2015-16 to 57.2 million ha in 2016-17). However, over the same period, the number of farmers insured has increased by 20.4 percent (from 47.5 million to 57.2 million), the sum insured has increased by 74 percent (from Rs 115432.4 crore to 200618.9 crore), and premiums paid have increased by 298 percent (from Rs 5491.3 crore to Rs 21882 crore). The government must be complimented for taking bold decision to increase premium subsidy and scaling up crop insurance.

However, the scheme with a noble intention to protect farmers can succeed only if operational guidelines are strictly followed and cut off dates are not extended frequently as was done in Kharif 2016. One of the reasons for high actuarial premium rates quoted by the reinsurance companies was the extension of cut off dates. Moreover, timely submission of yield data of CCEs and payment of premium subsidy to insurance companies will smoothen

and fasten the process of claim settlements as done by Tamil Nadu in Rabi 2016-17, Tamil Nadu when they experienced one of the worst droughts. Unfortunately, even after almost two years of the implementation of the scheme, mobile devices have not been procured to capture data of assessment of crop yield for assessment of crop damage. There were allegations of data manipulations while conducting CCEs like the yield of groundnut of Rajkot district in Gujarat in Kharif 2016. Karnataka has gone ahead and made compulsory use of mobile phones while conducting the CCE. They have made Samarakshane portal which provides information related to CCE claim statements, farmer-wise, including farmer's Aadhaar number and account number.

A large scheme like crop insurance takes away almost one-third of financial resources of the Department of Agriculture Cooperation and Farmers Welfare and it is administered by only two director level officers in the Ministry. Such a large and important scheme deserves a dedicated team of professionals which can collate and analyse the data collected from the states and insurance companies.

This paper draws lessons from some of the best international practices followed by countries such as China, Kenya and the USA. The heavy premium subsidy programme started by the Government of China in 2007 led to an expansion of insured farm area from 15 million hectares in 2007 to 115 million hectares in 2016. In India, total area covered under insurance in 2016-17 amounts to about 30 percent coverage of gross cropped area, less than half of what USA (89 percent coverage) and China has achieved (69 percentage coverage). The premium subsidy payable by the government is 80 per cent and 70 percent in China and USA, respectively. The Kenyan experience is significant due to its efficiency in settlement of claims within 2-4 days. Kilimo Salama (Safe Agriculture) is a weather index based insurance product developed by Syngenta Foundation for Sustainable Agriculture (SFSA) in 2009. They have developed an application that uses Safaricom mobile technology, M-pesa, to transfer money for payment of claims. Whenever there is a deviation from normal rainfall resulting in germination failure, the claim amount automatically gets transferred into the accounts of insured farmers.

This paper recommends widespread use of remote sensing technology in agriculture insurance programme with minimum human intervention in order to assess crop damages and expeditious settlement of claims. The application of drones, LEOS, and remote sensing satellites at fine resolution can prove to be effective in taking images, which could be used to assess crop damages in an area. Drones could be used to take images of crops affected by hail, wind, rainfall, etc. Because they fly at lower heights, problems such as cloud obstruction can be minimised. As soon as there is information on damage in a particular area, they could be deployed to assess damages in the area so that accurate scenario can be captured expeditiously. Recently, the world's largest corn processor Archer-Daniels-Midland Co. in USA received approval from the Federal Aviation Administration (FAA) to use drones to gather data on crop insurance claims. China has launched Low Earth Orbits (LEO) to capture images of vegetation in order to monitor crop growth around the world. Planet Labs, an

organisation based in San Francisco has developed satellites called “doves”. They fly on low orbit and collect data from any place on earth.

Based on the experience of other countries and rapid advancement in technology, this paper recommends adoption of modern technology to assess crop damage: satellite/LEOs/doves/drone/ images, Automatic weather stations and use of mobile-based technology for crop cutting experiments (CCE). We also suggest conducting high quality CCEs, switching from random selection of CCE to a science based selection approach on the basis of satellite technology and gradual transition from CCEs to using technological solutions for assessment of crop damage. A dedicated constellation of 5 satellites of high resolution with five day frequency is recommended to increase the precision of crop loss assessment at village level, which is expected to have an additional cost of Rs 1000 crore to the exchequer. There is a need to increase the density of Automatic Weather Stations (AWS) and rainfall data loggers. The entire country could be covered by installing additional 33000 AWS and 170,000 rainfall data loggers; this would cost the government between Rs.300-Rs.1400 crore, depending on the parameters required for AWS. In order to ensure timely settlement of claims, the government could make use of the JAM trinity by linking land records of farmers with their Aadhaar numbers and bank accounts. The use of mobile technology could be used for smart CCEs and direct submission of crop cutting data to servers. This can substantially reduce the time taken in compiling reports of crop cutting experiments from districts. It can also make the process of claim settlement much faster.

We recommend scaling up area insured to 100 million hectares as envisaged in the operational guidelines of the PMFBY. With more experience of PMFBY and enhanced competition among state governments to cover larger number of farmers, and as scale of insurance coverage increases, we hope rates of actuarial premiums will also come down. As they settle at lower levels (say below 8 percent) than the current ones (12.5 percent), the Government can think of raising the sum insured from just covering cost of cultivation to expected levels of income based on last three to five years yields and MSP data.

An increase in awareness among farmers through government agencies, insurance companies and banks is required. Farmers should be informed through an aggressive media campaign about compulsory deduction of premium, amount of sum insured, name of insurance company and the procedure for settlement of claims. IRCTC has already shown the way for railway tickets booked online by informing the passengers about insurance policy through an SMS and email. . There is also need to create excitement in this scheme as was done in the case of the PM’s Suraksha BimaYojana and PM’s Jan DhanYojana.

Crop Insurance in India: Key Issues and Way Forward

Ashok Gulati[*], Prerna Terway[#], Siraj Hussain[^]

1. Introduction

Indian agriculture has little more than half (53 percent) of its area still rain fed. This makes it highly sensitive to weather conditions, causing uncertainty in agricultural output. Extreme weather conditions such as floods, droughts, heat waves, cyclones and hailstorms cause extensive crop damage. Subtle fluctuations in weather during critical phases of crop development can have a substantial impact on yields. Climate change increases agricultural risk by increasing variability in rainfall, causing water stress, enhancing susceptibility to plant diseases and pest attack and, more importantly, raising the frequency, intensity and duration of extreme weather events like droughts, floods, cyclones and storm surges. According to the fifth report of the Inter-governmental Panel on Climate Change (IPCC), the average combined land and ocean surface temperature data has shown an increase of 0.85°C over the period 1880 to 2012. Climate change will be particularly hard on agricultural production in Africa and Asia. For wheat, rice and maize in tropical and temperate regions, climate change without adaptation is projected to negatively impact production. Therefore, it is necessary for countries to develop strategies for adaptation to climate changes.

The growth of agriculture in India has varied across states (Figure 1). Variations in the performance of agricultural growth across states and year to year fluctuations are major causes for concern for long term food security and also for welfare of farmers. The coefficient of variation indicates the volatility in agricultural growth rates across various states. A high coefficient of variation, indicating high volatility is observed in states like Kerala, Bihar, Rajasthan, Karnataka and Maharashtra.

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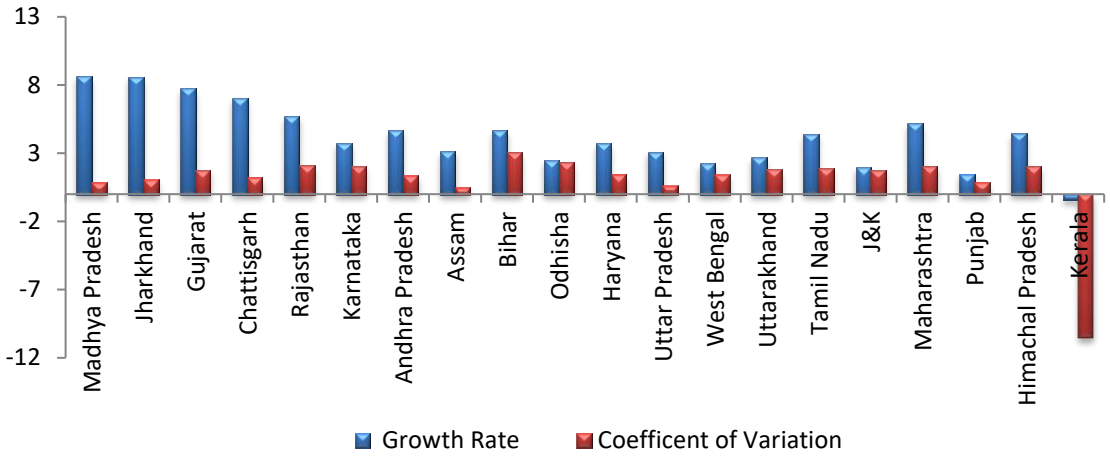
Figure 1: Average Annual Growth Rate (%) and Coefficient of Variation of GSDP Agriculture (2005-06 to 2014-15)



Source: National Accounts Statistics, CSO

Farmers primarily face two types of risks – yield risk and price risk. An unplanned and major variation in either the yield or price of a crop in a particular agricultural cycle can translate into significant losses to the farmer.

Yield risk refers to uncertainty regarding the quantity and quality of agricultural product harvested at the end of an agricultural cycle. Erratic rainfall distribution has an adverse impact on agricultural production. On an average, crops on 12 million hectares of land are damaged annually by natural calamities and adverse seasonal conditions in the country (Planning Commission, Eleventh Five-year Plan, 2007-2012). In the last fifteen years, there have been several years when deficiency in rainfall has adversely affected agricultural production. In 2002, rainfall deficit was 19 per cent due to which there was a loss of 38 million tonnes of food grains. The 2009 drought was the third worst since 1901, when a rainfall deficit of 18 per cent was recorded and there was a production loss of about 16 million tonnes of food grains.

Price risk refers to the uncertainty about prices that farmers receive for their produce. During years of high production, prices of crops slide downwards, affecting the incomes of farmers. There have been times when higher production of crops has led to prices falling to very low levels, even below MSP levels as happened after the Kharif of 2016 and 2017 in case of several pulses and oilseeds. Furthermore, farmers have not been adequately protected by MSPs in all states. Although MSPs are announced by the government for 23 commodities, they are mainly implemented for rice and wheat and that too in a few states of the country. The price risk is becoming more pronounced as Indian agriculture opens to global trade. In 2017-18, prices of several agricultural commodities like tur, urad, soybean, groundnut etc remained much lower than MSP causing widespread distress to farmers in several states.

Income of farmers depends on both prices and yield, which are inversely related to each other. When aggregate production of a commodity increases, market prices tend to decrease, and when yields fall, prices generally rise. This offsetting nature of price and production effects has somewhat cushioning impact on farmers' incomes.

Traditionally, successive governments have dealt with agricultural distress by relying on the practice of announcing relief packages from time to time. In 2006, a rehabilitation package of Rs 16,978.69 crore for farmers in 31 suicide-prone districts in Maharashtra, Kerala, Karnataka and Andhra Pradesh was approved. The Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS) was announced in May 2008, which cost the government Rs 52,516.86 crore. Recently, six states-Tamil Nadu, Maharashtra, Uttar Pradesh, Rajasthan, Karnataka and Punjab have announced farm-debt waivers and this is expected to spread to other states as well. Besides these irregular relief packages, the government also provides assistance to states from the State and National Disaster Response Fund. The cumulative amount released by the Centre for all calamities including drought and flood from National Disaster Response Fund between 2011-12 and 2015-16 amount to Rs. 24,055 crore[1]. These ad hoc relief measures provided by the government, in the wake of natural calamities, are characterised by severe limitations – lack of transparency in terms of any robust scientific basis for estimating compensation, non-payment in many cases, inadequate amount of compensation under SDRF and NDRF and delayed payment to farmers. Therefore, there is urgent need to develop a robust insurance system to insulate farmers from risks faced by them.

Although agricultural insurance has been present in the country since 1972, it suffers from operational weaknesses and it has not been able to adequately protect farmers against yield and price volatility.

This paper evaluates the agriculture insurance schemes that existed in the country before the PMFBY was introduced in Kharif 2016, how a transition was made to PMFBY and highlights the major challenges in implementation of PMFBY. Based on this evaluation, and also a review of how USA, China and Kenya are implementing crop insurance schemes, we make some recommendations that may help develop a robust crop insurance system in the country that is transparent, just in terms of sums insured, and quick in settling farmers' claims by using high end technology. A particular focus of this paper is on emphasising the role of technology and experience from some of the best international practices in crop insurance.

Section 2 of the paper deals with various agricultural insurance schemes implemented in the country since 1985.

Section 3 evaluates the performance of these insurance schemes with a particular focus on the new crop insurance scheme – PMFBY for Kharif 2016 and Rabi 2016-17.

Section 4 highlights some of the best international practices followed by countries such as USA, China and Kenya.

[1] Data source is Lok Sabha Starred Question No. 31 and Question No. 206

Section 5 highlights the use of technology in assessment and settlement if crop damage.

Section 6 concludes based on analysis carried out in previous sections and makes some recommendations with a view to improvise the functioning of PMFBY for the benefit of millions of farmers, especially small and marginal that dominates the landscape of Indian peasantry.

2. Evolution of Crop Insurance Schemes in India

2.1 Crop Insurance in India – The beginning

The first nation-wide crop insurance scheme was the Comprehensive Crop Insurance Scheme (CCIS) introduced in Kharif, 1985-. This scheme was based on an area approach and area units were identified for the purpose of assessing indemnity. This was replaced by National Agriculture Insurance Scheme (NAIS) in Rabi 1999-2000, which was further changed to the Modified National Agricultural Insurance Scheme (MNAIS) during Rabi 2010-11 (Annexure 1). Apart from these schemes, several other pilot projects such as Seed Crop Insurance (1999-00), Farm Income Insurance Scheme (Rabi 2003-04) and Weather Based Crop Insurance Scheme (Kharif 2007) were implemented from time to time. In April 2016, Pradhan Mantri Fasal Bima Yojana (PMFBY) - an area based scheme and Restructured Weather Based Crop Insurance Scheme (RWBCIS) was introduced.

2.2 Pradhan Mantri Fasal Bima Yojana (PMFBY) - Kharif 2016 onwards

Realizing the limitations of existing system of crop insurance that was not able to meet the needs of farmers, the NDA government announced a new crop insurance program. PMFBY scheme became operational from Kharif, 2016 with an objective to provide adequate insurance coverage and financial support to the farmers in the event of crop failure.

Features of the new scheme

(i) Sum Insured- The sum insured is equal to the Scale of Finance (SoF) for that crop as fixed by District Level Technical Committee. Sum Insured for individual farmer is now equal to the Scale of Finance per hectare multiplied by area of the notified crop proposed by the farmer for insurance. The scale of finance takes into account the cost of cultivation on the basis of land quality, irrigation expenses and facility as well as cost of fertilizers, seeds and labour which varies from one district to another.

(ii) Premium Rates: The premium rates payable by farmers for Food Crops and Oilseeds (FCOS) is fixed at 2 percent of the Sum Insured or Actuarial rate, whichever is less, for Kharif season and 1.5 percent for Rabi season. For commercial/horticulture crops, premium rate of 5 percent is fixed to be paid by the farmer. The difference between premium rate and rate of insurance payable by farmers will be shared by the Central government and the State government equally as premium subsidy.

(iii) Estimation of Crop Yield: The minimum number of Crop Cutting Experiments (CCEs) required at village level is 4 for major crops and 8 for other crops. Inputs from RST/satellite imagery would also be utilized in optimizing the sample size of CCEs.

(iv) Use of modern technology: The CCEs have been lacking in reliability and speed in estimation of crop yield. The use of mobile based technology with GPS stamping was recommended to improve the quality of data and make faster assessment of claims. The expense in procuring handheld devices/smart phones are to be borne equally by the Centre and the State, with a cap on total funds to be made available by the Central government. The use of technology available in the fields of remote sensing, aerial imagery, satellites etc. would reduce manpower and infrastructure. It is estimated that using a mix of modern technology can be expected to minimize the number of CCEs by about 30 percent.

(v) Role of Private players: The public sector company, Agriculture Insurance Company (AIC) of India along with other public and private insurance companies are participating in the new crop insurance scheme. The selection of Implementing Agency (IA) is made by state governments by adopting a cluster approach consisting of 15-20 'good' and 'bad districts', based on risk profile, with reference to the bid to be laid out. Selection of IA is to be made through competitive bidding upto 3 years.

(vi) Time frame for loss assessment: The cut-off date for the receipt of yield data is within one month of final harvest. Processing, approval and payment of final claims is based on the yield data and it is to be completed within three weeks from receipt of yield data.

(vii) Timely release of premium subsidy to Insurance Companies: The government (both Central and State) must release 50 percent share of premium subsidy to insurance companies, in the beginning of every crop season, based on fair estimates submitted by them, and settle balance of actual premium subsidy for season as soon as final figures are submitted by insurance company.

(viii) Publicity and awareness: Adequate publicity is to be given in all villages of the notified districts through fairs, exhibitions, SMS, short films, electronic and print media and documentaries. The crop insurance portal should be regularly uploaded with all published material information.

3. Evaluation of the Performance of crop insurance schemes

CCIS covered cereals, pulses and oilseeds. The premium rates were administered uniformly throughout the country. It was kept at 2 percent for rice, wheat and millet crops and 1 percent for pulses and oilseeds. It was subsidized by 50 percent for small and marginal farmers. However, high claim to premium ratio, which was 6.72 for an average of 15 Kharif seasons (1985-99), and 5.75 for an average of 14 Rabi seasons (1985-86 to 1998-99), made the scheme financially unviable. The sum insured was to be limited to Rs 10,000 per farmer,

irrespective of the size of loan and farm size (Report of the Committee to Review the Implementation of Crop Insurance Schemes in India, 2014).

This scheme was replaced by NAIS in 1999-2000 which was further modified and renamed as Modified NAIS during Rabi 2010-11. WBCIS was introduced in 2007.

Some of the **limitations** of these schemes are as follows:

Low penetration of agricultural insurance

The penetration of agricultural insurance in India was low and stagnant in terms of the area insured and the number of farmers covered till 2014-15. In the three years period (2013-14 to 2015-16), the average area insured under all the schemes combined was 16.3 million hectares in the Rabi and 29.7 million hectare in the Kharif. The number of farmers insured was 13 million in the Rabi and 25 million in the Kharif for all the schemes. The primary reason for low coverage was unaffordable high premium rates and capping of premium and sum assured under MNAIS. The average premium rate was around 10 per cent for MNAIS and WBCIS.

Premium and sum insured related issues

The sum insured was worked by multiplying the Notional Threshold Yield with MSP/average farm gate price. However, in MNAIS and WBCIS, premium rates were calculated on actuarial basis, (which was a departure from the administratively decided premium rate that prevailed during NAIS) and they were capped in order to reduce total expenditure on premium subsidy by both Central and state governments. Sum insured per hectare was reduced to an amount to commensurate with capped premium rates and this led to low sum insured for most of the crops. As actuarial premium rates under MNAIS were high for most of the insured crops in many districts, sum insured in certain cases was insufficient to even cover the cost of cultivation.

Delay in assessment and settlement of claims

The assessment of damage was based on the traditional system of crop cutting experiments that took 6-12 months. The settlement of claims took unduly long time; at times it extended beyond the next cropping season.

Area discrepancy

The issue of area discrepancy has been prevalent since early years of crop insurance as in many cases, area insured was greater as compared to the net sown area as reported by the government agencies. According to PK Mishra Committee report (2013) this problem was acute particularly in some districts of Gujarat growing groundnut as major crop. In Kharif 1993, the claim for groundnut alone was Rs 192.96 crore out of a total claim Rs 207.42 crore for all crops. The problem of area discrepancy continued even after the introduction of NAIS in Gujarat in Kharif 2000. To solve this problem of fudging of data by state machinery, area

correction factor[2] was applied by AIC but the states showed unwillingness to apply such correction factors.

3.1 Rolling out PMFBY: Experience of Kharif 2016 and Rabi 2016-17

With the new and improved features of PMFBY, overall area insured has increased marginally by 6.5 percent (from 53.7 million ha in 2015-16 to 57.2 million ha in 2016-17). However, over the same period, the number of farmers insured has increased by 20.4 percent (from 47.5 million to 57.2 million), the sum insured has increased by 74 percent (from Rs 1,15,432.4 crores to 2,00,618.9 crores), and premium paid has increased by 298 percent (from Rs 5,491.3 crores to Rs 21,882 crores). India has definitely taken a leap forward and it appears that a structural breakthrough has been achieved for which GoI deserves appreciation. But the use of mobile based technology, smart Crop Cutting Experiments (CCEs), digitisation of land record and linking them to farmers' account for faster assessment/settlement of claims are some of the steps that are yet to be fully accomplished for effective implementation of the new crop insurance scheme.

Farmers Insured

The total number of farmers insured has increased by 20.4 percent (from 47.5 million to 57.2 million between 2015-17 and 2016-17. The new crop insurance scheme has provided coverage to 38.9 million farmers in Kharif 2016 as compared to 25.4 million farmers in Kharif 2015, an increase of 53.1 percent (Table 1a). In Rabi 2016-17 the number of insured farmers insured under PMFBY is 16.2 million, an increase of 17.4 percent from Rabi 2015-16 (Table 1b). The increase in number of farmers insured is significant in Gujarat, Himachal Pradesh, Karnataka, Uttar Pradesh and West Bengal in Kharif 2016 (Annexure 2). In Rabi 2016-17, total farmers insured (including WBCIS) has increased marginally by 0.6 percent. The number of insured farmers has declined in a few states like Bihar, Maharashtra and Rajasthan in Rabi 2016-17 (Annexure 3).

In a communication issued by Public Information Bureau, GoI (dated 7.12.2016)[3], the government has claimed that there has been an increase of more than 6 times in the coverage of non-loanee farmers from 1.49 million in Kharif 2015 to 10.26 million in Kharif 2016, which shows that the scheme has been well received by the non-loanee segment. However, figures received from industry show that the number of non-loanee farmers has increased from 9.87 million in Kharif 2015 to 10.18 million in Kharif 2016, an increase of merely 2.4 percent. According to our discussion with experts, increase in the number of non-loanee farmers is mainly in Maharashtra where farmers reported as non-loanee have increased from nil in Kharif 2015 to 7.2 million in Kharif 2016. This is due to a judgement of Bombay High Court which ruled that loanee farmers cannot be forced to take insurance. Therefore all the farmers taking insurance are considered non loanee farmers.

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2 The area-correction factor is arrived at by dividing the area sown by the area insured for a given unit area, and applied on the claim amount in order to scale it down. As a result, the claims of all the farmers in a unit area are scaled down uniformly.

3 http://pib.nic.in/newsite/PrintRelease

According to data from the industry, the PMFBY, like previous schemes, is primarily covering only loanee farmers as they account for 74 percent of total farmers insured in Kharif 2016 and 79 percent in Rabi 2016-17. However, there is a significant jump in non loanee farmers in Jharkhand, AP, Karnataka and Tamil Nadu. In Gumla Simdea region of Jharkhand, the State Co-operative Bank has reported that 62,567 non-loanee farmers took crop insurance for paddy and 11,789 for maize in Kharif 2017.

Table 1a: Farmers Covered (million) under NAIS, WBCIS, MNAIS and PMFBY (Kharif 2013 to Kharif 2016)[4]

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Kharif 2012	10.7	2.1	**12.8**		8.1	**20.9**	
Kharif 2013	9.7	2.4	**12.1**	-5.5	8.9	**21.0**	0.5
Kharif 2014	9.7	5.9	**15.6**	28.9	8.2	**23.8**	13.4
Kharif 2015	20.6	4.8	**25.4**	62.8	5.4	**30.8**	29.4
Kharif 2016 (PMFBY)	38.9		**38.9**	53.1	1.5	**40.4**	31.2

Source: Agricultural Statistics at a Glance and Industry data

Table 1b: Farmers Covered (million) under NAIS, WBCIS, MNAIS and PMFBY (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Rabi 2012-13	6.1	1	**7.1**		5.6	**12.7**	
Rabi 2013-14	4	3	**7**	-1.4	5.3	**12.3**	-3.1
Rabi 2014-15	7.1	3.2	**10.3**	128.9	3.1	**13.4**	8.9
Rabi 2015-16	10.1	3.7	**13.8**	34.0	2.9	**16.7**	24.6
Rabi 2016-17 (PMFBY)	16.2		**16.2**	17.4	0.6	**16.8**	0.6

Source: Agricultural Statistics at a Glance and Industry data

Area Coverage

The total area insured in kharif and rabi taken together has increased only slightly by 6.5 percent (from 53.7 million ha in 2015-16 to 57.2 million ha in 2016-17). The area under the new scheme has increased from 27.2 million hectare (MNAIS & NAIS combined) in Kharif 2015 to 36.6 million hectare (PMFBY) in Kharif 2016, an increase of 34.6 percent (Table 2a). States registering significant increase in area coverage in Kharif 2016 included Assam, Gujarat, West Bengal and Uttarakhand (Annexure 4). In Rabi 2016-17, area insured has shown a marginal decline as compared to Rabi 2015-16.

Area insured under WBCIS has however fallen from 11.1 million hectare in Kharif 2012 to 1.3 million hectare in Kharif 2016, drop of about 88 percent (Table 2a). Our discussions with experts in the industry reveal the following main reasons for this drastic fall in area insured:

[4] All data related to Kharif 2016 and Rabi 2016-17 are updated as on December, 2017

High Actuarial Premium Rates

The actuarial rates vary across states. With the removal of capping of premium rates and no reduction in sum insured, actuarial premium rates have increased in Kharif 2016 compared to previous years. It increased from 11.6 percent in Kharif 2015 to 12.5 percent in Kharif 2016 (Table 6a). For WBCIS, the actuarial premium rates were as high as 43 percent and 33.5 percent for states like Rajasthan and Maharashtra, respectively, in Kharif 2016 (Annexure 6). In case of horticulture crops also, actuarial premium rates were at very high levels in Kharif 2016. For example, in case of Maharashtra it varied in the range of 40 percent to 55 percent for pomegranate and 55 percent to 70 percent for guava.

Faulty Product Design

Our discussions with insurers further revealed that in many cases, there is no correlation between temperature and other triggers in the weather station and yield calculation. Whenever there is a temperature trigger, farmers are eligible for compensation even if there is no reduction in yield. As informed by insurance companies, agriculture departments of states prepare term sheets but in many cases these are designed in such a manner that it necessarily triggers a payout. For example, in case of Alwar district in Rajasthan, farmers were eligible for compensation in case rainfall received was below 300 mm (Annexure 7). Historical data of this district show that in the past twenty years this amount of rainfall has never been received. Therefore, insurance companies (aware of almost compulsory payout) quoted high actuarial rates of 70 percent to recover their losses.

Ethical Issues

The authors were informed by some key stakeholders in the crop insurance chain that there were cases of unethical practices in some districts by manipulating temperature at the weather station to cause "trigger". For example, in Churu district of Rajasthan in 2013 and 2014, there are allegations that some famers had used ice in the weather station that led to deviation in actual temperature and they became eligible to receive claims.

Table 2a: Area Insured (million ha.) under NAIS, WBCIS, MNAIS and PMFBY (Kharif 2012 to Kharif 2016)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Kharif 2012	15.7	2.2	**17.9**		11.1	**29**	
Kharif 2013	14.3	2.3	**16.6**	-7.3	11.2	**27.8**	-4.1
Kharif 2014	11.6	7.0	**18.6**	12.0	9.6	**28.2**	1.4
Kharif 2015	21.7	5.5	**27.2**	46.2	6.3	**33.5**	18.8
Kharif 2016	36.6		**36.6**	34.6	1.3	**37.9**	13.1

Source: Agricultural Statistics at a Glance and Industry data

Table 2b: Area Insured (million ha.) under NAIS, WBCIS, MNAIS and PMFBY (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Rabi 2012-13	8.7	0.7	**9.4**		5.9	**15.3**	
Rabi 2013-14	6.5	3.3	**9.8**	4.3	5.3	**15.1**	-1.3
Rabi 2014-15	9.3	3.6	**12.9**	31.6	4.8	**17.7**	17.2
Rabi 2015-16	11.8	3.5	**15.3**	18.6	4.9	**20.2**	14.1
Rabi 2016-17	18.9		**18.9**	23.5	0.4	**19.3**	-4.5

Source: Agricultural Statistics at a Glance and Industry data

Gross Premium

In MNAIS and WBCIS, the premium rates were capped at 11 per cent and 9 per cent (of sum insured) for food and oil seeds crops for Kharif and Rabi season respectively. In case of crops whose premium was higher than the capped level, sum insured was reduced to capped level whereas actuarial rates continued to apply (Reduction in sum insured was only in case of MNAIS). It was basically done to reduce the liability of GOI and State Government towards premium subsidy. In NAIS there was no such restriction on sum insured as the claim itself was paid by Central and State Government if it exceeded the total premium amount. The capping resulted in very low sum insured and high premium rate under MNAIS. This issue has now been resolved in PMFBY. There is no capping on premium rates and sum insured is now based on the Scale of Finance for the district as decided by district level technical committee. With the removal of capping on premium rates, sum insured has increased significantly in few districts. One such example is that of maize crop in Gorakhpur district of Uttar Pradesh. The actuarial rate for Kharif maize 2015 under MNAIS was 57 percent and the original sum insured was Rs 8,415/ha. However, as capped premium rate of 11 percent was applicable, the sum insured was reduced to Rs 1624/ha. With the implementation of the new scheme, the actuarial rate for maize in the same district in Kharif 2017 went down to 4.22 percent and the sum insured has increased to Rs 12,096/ha.

Under PMFBY, the farmers' share of premium (as percentage of sum insured) is fixed at 2 percent in Kharif 2016 and farmer's share in gross premium accounts to 17 percent[5]. Difference between actuarial rate and farmers' premium is being given as premium subsidy by GoI and State Government. Thus, farmers are receiving premium subsidy to the extent of 83 percent by the Central and the State government[6]. The government has allocated Rs 13,000 crore in 2018-19 (BE). The expenditure for 2016-17 and 2017-18 (RE) was Rs 11,051 crore and Rs 10,698, respectively. It included the amount required to settle pending claims under NAIS.

[5] In Kharif 2016, the total value of gross premium for Kharif 2016 under PMFBY is Rs 15,488 crore out of which Rs 2666 crore is borne by farmers.

[6] The level of subsidy would differ depending on the actuarial premium discovered through bidding.

With the removal of capping on premium rates, there has been a quantum jump in gross premium (Table 3a and 3b). It has increased by 486.6 percent (for PMFBY) in Kharif 2016 and almost 275.3 percent in Rabi 2016-17.

Table 3a: Gross Premium (Rs crore) under NAIS, WBCIS, MNAIS and PMFBY (Kharif 2012 to Kharif 2016)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Total	% Increase
Kharif 2012	878	564	**1442**		1294	**2736**	
Kharif 2013	975	639	**1614**	11.9	1478	**3092**	13.0
Kharif 2014	844	928	**1772**	9.8	1565.5	**3337.5**	7.9
Kharif 2015	1828	812.4	**2640.4**	49.0	986.9	**3627.3**	8.7
Kharif 2016	15488.3		**15488.3**	486.6	863.2	**16351.2**	350.8

Source: Agricultural Statistics at a Glance and Industry data

Table 3b: Gross Premium (Rs crore) under NAIS, WBCIS, MNAIS and PMFBY (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Total	% Increase
Rabi 2012-13	447.6	189	**636.6**		923.0	**1559.6**	
Rabi 2013-14	297.5	434.8	**732.3**	-27.6	923.4	**1655.7**	6.2
Rabi 2014-15	550.6	501.5	**1052.1**	43.7	556.4	**1608.5**	-2.9
Rabi 2015-16	716.7	543.8	**1260.5**	19.8	603.5	**1864.0**	15.9
Rabi 2016-17	4731.1		**4731.1**	275.3	798.9	**5530**	196.7

Source: Agricultural Statistics at a Glance and Industry data

Sum Insured

The sum insured for both loanee and non-loanee farmers are equal to the scale of finance as decided by the District Level Technical Committee (DLTC). For an individual farmer, the sum insured is equal to the Scale of Finance per hectare multiplied by area of the notified crop proposed by the farmer for insurance. In NAIS and MNAIS, the sum insured for loanee farmers was equal to the amount of crop loan sanctioned which was extendable upto the value of the threshold yield. There are many instances when a State Government fixed sum insured very low so that the outgo under NAIS for payment of claims was limited and premium subsidy under MNAIS borne by State Government was not very high.

As compared to Kharif 2015, the total sum insured for all the states has increased from Rs 60,773 crore (MNAIS & NAIS) to Rs 1,24,382 crore (PMFBY) in Kharif 2016, an increase of about 104.7 percent (Table 4a). The total value of sum insured under PMFBY and RWBCIS combined has increased by 89.4 percent in Kharif 2016. In Rabi 2016-17 sum insured has increased by 65.3 percent under PMFBY and 50.3 percent in PMFBY and RWBCIS (Table 4b).

The sum insured per hectare was Rs 33,984 in Kharif 2016 and Rs 34,847 in Rabi 2016-17 (Table 5a and 5b) under PMFBY. However, even under PMFBY farmers are provided coverage only to the extent of cost of cultivation as estimated by DLTC for arriving at Scale of Finance (SoF) and not the loss of their prospective incomes. Therefore even though there is an increase in sum insured per hectare, this amount may still not be adequate to cover a farmer's risk of loss of income due to lower market prices. The maximum claim is limited to cost of cultivation, not loss of prospective income.

Table 4a: Sum Insured (Rs crore) under NAIS, WBCIS, MNAIS and PMFBY (Kharif 2013 to Kharif 2016)

Season	NAIS	MNAIS	Total	% Increase	WBCIS		% Increase
Kharif 2012	27199	4897	**32096**		12871	**44967**	
Kharif 2013	28924	5825	**34749**	8.3	14623	**49372**	9.8
Kharif 2014	24389	9481	**33870**	-2.5	13254	**47124**	-4.6
Kharif 2015	52508	8265	**60773**	79.4	8533	**69306**	47.1
Kharif 2016	124382		**124382**	104.7	6903	**131285**	89.4

Source: Agricultural Statistics at a Glance and Industry data

Table 4b: Sum Insured (Rs crore) under NAIS, WBCIS, MNAIS and PMFBY (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Total	% Increase
Rabi 2012-13	15708	2077	**17785**		10655.5	**28440.5**	
Rabi 2013-14	12549.5	6406.5	**18956**	6.6	10901.9	**29857.9**	5
Rabi 2014-15	21512.5	9107.8	**30620.3**	61.5	4400.4	**35020.7**	17.3
Rabi 2015-16	27809.6	12022.6	**39832.2**	30.1	6294.2	**46126.4**	31.7
Rabi 2016-17	65860.8		**65860.8**	65.3	3473.1	**69333.9**	50.3

Source: Agricultural Statistics at a Glance and Industry data

Table 5a: Sum Insured (Rs) per hectare under NAIS, MNAIS and PMFBY (Kharif 2012 to Kharif 2016)

Season	NAIS	MNAIS	WBCIS
Kharif 2012	17324	22259	11595
Kharif 2013	20227	25326	13056
Kharif 2014	21025	13544	13806
Kharif 2015	24197	15027	13544
Kharif 2016	33984		53100

Source: Authors' calculations

Table 5b: Sum Insured (Rs) per hectare under NAIS, MNAIS and PMFBY (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	WBCIS
Rabi 2012-13	18055	29671	18060
Rabi 2013-14	19307	19414	20570
Rabi 2014-15	23132	25299	9168
Rabi 2015-16	23567	34350	12845
Rabi 2016-17	34847		86828

Source: Authors' calculations

Table 6a: Gross Premium as a Percentage of Sum Insured (Kharif 2012 to Kharif 2016)

Season	NAIS	MNAIS	WBCIS
Kharif 2012	3.2	11.5	10.1
Kharif 2013	3.4	11	10.1
Kharif 2014	3.5	9.8	11.8
Kharif 2015	3.5	9.8	11.6
Kharif 2016	12.5		12.1

Source: Authors' calculation

Table 6b: Gross Premium as a percentage of Sum insured (Rabi 2012-13 to Rabi 2016-17)

Season	NAIS	MNAIS	WBCIS
Rabi 2012-13	2.8	9.1	8.7
Rabi 2013-14	2.4	6.8	8.5
Rabi 2014-15	2.6	5.5	12.6
Rabi 2015-16	2.6	4.5	9.6
Rabi 2016-17	7.2		22.7

Source: Authors' calculations

3.2 Challenges in the Implementation of PMFBY

Extension of cut off dates

As Kharif 2016 was the first cropping season of the new scheme, various states claimed that they faced teething problems in bidding process for selection of the insurance companies for concerned clusters. After the issue of guidelines by GOI in February 2016, several State Governments invited bids for discovering actuarial rates for various crops in cluster of districts. As against the original cut-off date of July 31, mentioned in the operational guidelines of the scheme, some states requested the Centre for an extension of cut-off date. Thus, due to delay in carrying out the requisite preliminaries the date of tender submission was extended to 10th August 2016.

However, most of the states that floated their tender on time and completed the tender process were able to receive low actuarial premium rates. For example states like Andhra Pradesh, West Bengal and Chhattisgarh completed their bidding process in the months of April and May, 2016. These states were able to receive actuarial rates between 4-9 percent. However, other states like Bihar, Gujarat, Rajasthan and Maharashtra were late in opening and evaluating bids and completed the process only in the months of June and July, 2016 and they received high actuarial rates of around 20 percent (Annexure 6). Moreover, requests for such extensions of cut-off dates by State Government in future could lead to the problem of adverse selection. For example, Bihar encountered excessive rainfall and flood during Kharif 2016. The tender was floated in July, 2016 when the flood situation was already known. As a result, the companies quoted very high actuarial rate of 17 percent. Moreover, the reinsurance companies also quoted high reinsurance rates. Similarly, after the demonetisation of Rs 500 and Rs 1000 currency notes was announced by the government, the cut off dates for enrolment under PMFBY in Rabi 2016-17 was extended to 10th January, 2017 from the original date of 31st December, 2016**.**

Actuarial Premium rates and premium subsidy

The gross premium for FY 2016-17 is Rs 21,882 crore (PMFBY and RWBCIS) out of which famers' share is Rs 4,373 crore. The remaining premium subsidy is shared by the Central government and the State government. The share of the Central Government was Rs 6,623 crore in Kharif 2016 and Rs 2,182 crore for Rabi 2016-17. Thus the total amount required for premium subsidy by the Central government was Rs 8,805 crore in 2016-17. As mentioned above, there were outstanding bills of NAIS also. Due to increase in premium subsidy in Kharif 2016, the government revised the amount allocated towards crop insurance to Rs 11,051 crore in FY 2016-17. In 2016-17, the actual expenditure of DACFW on all the schemes was Rs 36,912 crore out of which Rs 13,397 crore was for interest subvention. Thus if interest subvention is excluded from department's budget, premium subsidy on crop insurance took almost 17 percent of the budget of Department of Agriculture, Cooperation and Farmers' Welfare

With an increase in area insured it was expected that the actuarial premium rates would go down. However, gross premium as a share of sum insured increased to 12.5 percent in Kharif, 2016. Although there is an increase in the actuarial premium rates, it must be noted that there are comparability issues across various insurance schemes. In case of NAIS, premium rates were administered by the government and in MNAIS they were market determined but capping on these rates acted as a barrier in real discovery of actuarial premium rates. Under PMFBY, capping on premium rates was removed and therefore the actuarial rates of 2016-17 can be said to perhaps reflect the risk profile more accurately.

Experts in the industry also informed the authors that high actuarial rates were also caused by the expansion of reinsurance market. According to them, only 25 percent of risk (as a percentage of sum insured) is absorbed by the domestic insurance companies. Out of the remaining 75 percent, 50 percent is absorbed by the domestic reinsurance company (General Insurance Corporation) and balance 25 percent by foreign reinsurance companies. Some of

the major foreign players include Swiss Re, Munich Re, SCOR, Hannover Re and Berkshire Hathaway. The risk has shifted from insurance companies to the reinsurance companies and therefore the actuarial premium rates may not come down anytime soon unless the administration of scheme at the state level improves substantially. Contrary to this statement, some other experts have suggested that with an increase in area insured to 100 million hectare, the actuarial premium rates could come down to as low as 3-4 percent. However, as it appears today, with rather unpredictable ways of implementation of the scheme, reinsurers don't have full confidence and therefore premium rates are likely to remain high unless concerted efforts are made to strictly follow operational guidelines of the scheme so that reinsurers get the confidence that Indian crop insurance players, including the state governments would play by the rules. Payment of premium subsidy by government to insurance companies in time and adherence to cut-off dates are the minimum pre-conditions to encourage insurance companies to quote lower rates in future.

Inadequate insurance coverage

Sum insured per hectare has increased to Rs 33,984 in Kharif 2016 and Rs 34,847 in Rabi 2016-17 under PMFBY. As PMFBY is yield based, price risk is still not covered and farmers remain exposed to volatility in prices of agricultural commodities. So, even the new crop insurance scheme has not been able to cover loss of prospective income of farmers due to vagaries of market. Sum insured was to be equal to the SoF for that crop as fixed by District Level Technical Committee. But the data for Kharif 2016 reveals that sum insured in many districts was way lower than SoF. For example, in Alwar and Dungarpur district in Rajasthan, SoF for cotton was Rs 58,500 per hectare and Rs 1,50,000 per hectare, respectively against sum insured of Rs 15,720 and Rs 18,720 per hectare, respectively. This was possibly done as the state government may have preferred lower sum assured so as to restrict its share of premium subsidy.

Insufficient and inefficient CCEs

The total number of CCEs planned by the government for both Kharif and Rabi season in 2016-17 was 9.27 lakh. With the CCEs being brought down to village panchayat level, it is expected that the number of CCEs will go up to 30 lakhs (20 lakhs in Kharif season and 10 lakhs in Rabi season). In the operational guidelines of PMFBY, the use of mobile based technology with GPS stamping has been mandated to improve the quality of data and make faster assessment of claims. However, neither the number of CCEs has increased nor have the State governments in most of the states procured mobile devices to make smart assessment of crop yield. Our discussions with experts reveal that there were large scale data manipulations in some cases while conducting CCEs. For example there is egregious case of, Rajkot district in Gujarat in Kharif 2016 where it is claimed that the yield of groundnut was largely underestimated which made the insurance companies liable to pay exaggerated claims to farmers. As informed by experts in the industry, despite bumper harvest of groundnut, the yield was reported to be 500 kilograms per hectare against actual estimated yield of about 1200 kilograms per hectare. Due to underestimation of crop yield, insurance companies may become liable to pay huge claims even if there is no actual reduction in yield of crops. This is

nothing short of a fraud in the name of crop insurance and brings very bad name to the implementation failure of PMFBY. It needs to be investigated at the highest level, responsibility must be fixed and stern action may be initiated against unscrupulous elements. Only then PMFBY can be salvaged and premiums reduced. Else, we are afraid, it may not serve its intended purpose. It may be emphasized that if GoI wants PMFBY to succeed, it has to ensure transparency in conduct of CCE and prevention of malpractices.

Assessment and payment of claims

The state government is responsible for providing yield data of CCEs to insurance companies and claims are to be settled within three weeks from the date of data receipt. But companies have not yet paid their claims to farmers and they have cited delay in receiving premium subsidy from the state government as the main reason for delay settlement on claims. For instance insurance companies have partially received premium subsidies from states like Bihar, Assam, Madhya Pradesh and Karnataka (Annexure 8). Another reason for delay in this process is late submission of yield data by states to companies, which extends way beyond the required date of notification. This is true in case of states like Gujarat and Tamil Nadu in Kharif 2016 and Rajasthan and Tamil Nadu in Rabi 2016-17 that have partially submitted yield data to insurance companies.

There have been allegations in media made that insurance companies have made large profits at the cost of farmers and government as gross premium collected is far greater than claims paid to farmers. It must be noted that Kharif 2016 was a year of normal monsoon with only 3 percent shortfall at all India level and drought prone regions in Central India received 6 percent above normal rains. In normal rainfall years, it will be common that claim payouts are likely to remain lower than premiums collected, while in bad years with drought/floods, etc the claims may even exceed premiums collected. The nature of insurance business has to be seen over a cycle of about 5 years, which includes good, normal, and bad years to see how far the premiums collected match with payments made as compensation. The total amount of claims paid is 2016-17 (PMFBY and RWBCIS) is Rs 12,117 crore against claims reported worth Rs 13,692 crore till December 2017. However, during drought/flood years, claims paid would surpass gross premium collected depending on the intensity of weather calamity. Thus, the effectiveness of PMFBY cannot be judged on the basis of data of one year. .

The case of Tamil Nadu is worth highlighting as the state experienced one of the worst droughts in 2016-17. The total claim paid to farmers in Rabi 2016-17 is Rs 2,414 crore against gross premium of Rs 1,232 crore and the premium to claim ratio of 1.96 (196 percent). The yield data on CCE for Rabi 2016-17 was furnished to insurance companies in time (by 1/05/2017) and the state government also paid its share of premium subsidy to the insurance companies. As a result, most of the farmers in Tamil Nadu received claims for their crop damage caused by drought in that season. This stands as an outstanding example that could be emulated by other states to provide yield data and premium subsidy on time to insurance companies. The case of Karnataka is also worth mentioning as they have made a portal dedicated to crop insurance and all the information relating to this scheme is made

available on this website (Box 1). Thus insurance companies could disburse claims within one week of receipt of yield data.

BOX 1: CASE STUDY OF KARNATAKA

Karnataka Government has made Samarakshane portal which has been operational for about 20 months. It handles all facets of PMFBY right from issue of notification till the payment of the compensation, including updation of such compensation details. Number of crop cutting experiment required for CCE is 4 for major crop and notified at Gram Panchayat level and 10 for minor crop notified at Hobli (sub taluka) level. The number of experiments under NAIS during Kharif 2015 was 74,242 and this has increased to 85,166 in Kharif 2016 and further to 88,434 in Kharif 2017. For crop cutting experiments, mobile phones have been made mandatory. Mobile phones were introduced under Kharif 2016 and as induction of mobile phones was delayed, 32,447 experiments out of 85,166 experiments were conducted by mobile phones. In Rabi & Summer 2016-17 all 52,208 experiments were conducted using mobile phones. They are used to capture images of CCE increasing transparency and accuracy of the data.

It is not just the Crop Cutting Experiment data that is given to the insurance company. It includes other information such as claim statements, farmer-wise including farmer's Aadhaar number and account number. The insurance company can make the payment soon after the sheet is given.. However, compensation is delayed by some insurance companies as they raise objection on the CCE data provided by the government. To address this issue, since Kharif 2017, insurance companies are made to participate in CCE and can raise objections on the mobile phone platform itself. Thereafter, they would not be allowed to raise any objections at a later point of time. This will enhance transparency in the data received for CCE so that claims could be disbursed to farmers on time.

Thus, other states should design similar portal like Karnataka and provide complete information of CCE, use of technology, updation of pictures from CCE and provide timely information to insurance companies and also involve them in CCE. State portals should be linked to crop insurance portal of GoI so that there is no mismatch in data. State portals should be linked to crop insurance portal of GoI so that there is no mismatch in data.

The litmus test of any crop insurance scheme depends on quick assessment of crop damage and payment of claim into farmers' bank account. The infrastructure to make this scheme fully operational is still inadequate. Timely submission of yield data by State government to the insurance companies is necessary so that they can finalise the claims expeditiously and pay the claims to farmers. .

A comparative statement of these three schemes, NAIS, MNAIS, and WBCIS, on various parameters is given below in Table-7.

Table 7: Comparison between NAIS, MNAIS and PMFBYs

Details	NAIS	MNAIS	PMFBY (2016-17)	Highlights of PMFBY
1. Penetration of these schemes in terms of farmers covered (average between 2013-14 and 2015-16 for NAIS and MNAIS)	**Covered 20.3 million farmers** (7 million farmers in Rabi season and 13.3 million farmers in Kharif season)	**Covered 7.7 million farmers** (3.3 million farmers in Rabi season and 4.4 million farmers in Kharif season)	**Covered 55.1 million farmers** (16.2 million farmers in Rabi 2016-17 and 38.9 million farmers in Kharif 2016)	Increase in farmers covered by **96 percent**
2. Coverage in terms of area insured (average between 2013-14 and 2015-16 for NAIS and MNAIS)	**Covered 25 million hectares** (9.2 million hectares in Rabi season and 15.8 million hectares in Kharif season)	**Covered 8.3 million hectares** (3.4 million hectares in Rabi season and 4.9 million hectares in Kharif season)	**Covered 55.4 million hectares**(18.9 million hectares in Rabi 2016-17 and 36.6 million hectares in the Kharif 2016)	Increase in area coverage by **66 percent**
3. Use of Crop Cutting Experiments (CCE)	Based on block level: Panchayat provision was present	Based on Panchayat level.	Based on Panchayat level.	Increase in the number of CCE
4. Level of Indemnity	Three levels of indemnity—**90 per cent, 80 per cent and 60 per cent, corresponding to low-risk, medium-risk and high-risk areas**	Two levels of indemnity-**90 percent and 80 percent**	Three levels of indemnity—**90 per cent, 80 per cent and 70 per cent**	Three level of indemnity
5. Threshold Yield	Based on moving average yield, of past three years, in case of rice and wheat, and five years' yield in case of other crops, multiplied by the level of indemnity	Based on average of seven years [excluding a maximum of two years in which a calamity such as drought]	Based on average of seven years [excluding a maximum of two years in which a calamity such as drought]	
6. Sum Insured	Extendable up to 150% value of average yield of the insured crop	Calculated by multiplying Notional Threshold Yield (Average yield of 7 years) with MSP/farm gate price which is reduced to capped level of premium rates	Scale of Finance (equal to the cost of cultivation) as decided by District Level Technical Committee	Based on Scale of Finance
7. Sum Insured Covered	**No reduction** in sum insured	**Reduction in sum insured** if actuarial premium rates exceeds capped premium rates	**No reduction** in sum insured	Increase in sum insured by **89 percent (between 2015-16 and 2016-17)**

8. Settlement of Claims	No provision of 'on account' settlement of claims	'On account' payment of up to 25 percent as immediate relief to farmers	**On account payment of up to 25 percent for prevented sowing/crop** damage reported more than 50 percent	
9. Premium Rates	Based on **administered** premium rates	Based on **actuarial** premium rates	Based on **actuarial** premium rates	
9. Premium subsidy	It started with 50 percent subsidy, which was to be reduced to present 10 percent every year only to small and marginal farmers.	Calculation of subsidy is based on premium slabs.	Heavily subsidised-**about 83 percent** by Central and State Government	Heavy increase in premium subsidy-**83 percent**
10. Funds allotted	An **open ended scheme** where the state was allotted funds by the centre in case of any damage making it lucrative for the states	There was no such provision and the states were reluctant to switch to MNAIS.	**Both Centre and State government** to provide **subsidies** to insurance companies	

4. Learning from International Best Practices

The previous section discussed the existing system of agricultural insurance in India highlighting its limitations in terms of area insured, premium rate, and government support in the form of subsidy. It becomes pertinent to have an understanding of the practice of crop insurance followed in other countries, particularly China which also has small agricultural landholdings like India.

4.1 Crop Insurance in USA

In 1938, Congress formed the Federal Crop Insurance Corporation (FCIC) to protect the income of the farmer from falling prices and crop failure. The insurance coverage was limited to only wheat and cotton and this programme suffered from heavy losses and low participation rates. Till 1980, this programme was mainly run by the government. With the passage of the Federal Crop Insurance Act of 1980, there is increased involvement of private players that has laid the foundation of its success.

The Federal Crop Insurance Reform Act of 1994 was passed to address the ad hoc disaster compensations that were released from time to time by the government.[7] The participation of farmers in crop insurance programme was made compulsory to be eligible for deficiency payments under price support programmes. As participation in this programme was compulsory, catastrophic (CAT) coverage was created where premium was subsidised. In 1996, the Risk Management Agency (RMA) was created to administer FCIC programmes and other non-insurance related risk management and education programmes that support US agriculture. The RMA of the U.S. Department of Agriculture sets the rates that can be charged and determines which crops can be insured in different parts of the country. Private companies are obligated to sell insurance to every eligible farmer who requests for it. Efforts made by the government led to a substantial increase in area insured and by 1998, more than 180 million acres (73 million hectares) of farmland was insured, covering around 52 percent of cropland, which is almost twice the area insured in 1993. The increase in premium subsidies has made the insurance products more attractive and affordable to farmers.

There are two types of crop insurances available to farmers in the USA: multi-peril crop insurance (MPCI) and crop hail policy.

While the crop hail policy is not a part of the FCIP, they are directly provided to farmers by private insurers. The farmers purchase this policy in areas where crops are affected by frequent hailstorms. They can be purchased at any time in the agricultural season.

On the other hand, MPCI is overseen and regulated by RMA. This is a public-private partnership programme and 19 private companies are currently authorised by USDA RMA to write MPCI policies. These policies cover loss in yield due to extreme weather conditions

[7] A major drought in 1988 led to the ad hoc disaster assistance programme to provide relief to farmers. This was followed by a series of disaster bills in 1989, 1992 and 1993.

and price risk to protect framers against potential loss in income. The crop insurance products include individual plans as well as area plans.

The government plays an important role not only in subsidising the insurance premium of farmers but also in reimbursing the operating and administrative expenses incurred by private insurers. The subsidy provided by the government accounts for approximately 70 per cent of the total premium amount (including operating and administrative expenses). The insured area has increased to 120 million hectares in 2015. Thus, area insured has increased from 52 percent of cropland in 1998 to 89 percent[8] in 2015.

Table 8: Area Insured and Premiums paid by the Government (USA)

Year	Insured Hectares (million)	Premium (million USD)	Share of Premium paid by Government (%)
2004	89	4,186	59.17
2005	100	3,949	59.36
2006	98	4,580	58.56
2007	110	6,562	58.26
2008	110	9,851	57.77
2009	107	8,951	60.63
2010	104	7,595	62.04
2011	108	11,971	62.33
2012	115	11,114	62.78
2013	120	11,788	61.80
2014	119	10,042	61.69
2015	121	9,747	62.34

Source: United States Department of Agriculture, Risk Management Agency, 2016

Revenue insurance protects farmers against fluctuations in price and yield and it has become the most popular insurance product in the USA. Although, revenue insurance was tried by several countries including Canada, Europe and Spain, USA is the only country in the world that has been successful in running revenue insurance scheme. At present, revenue premium accounts for nearly 85 per cent of total premium. Different insurance plans have various level of coverage. For example, in the case of actual production history, insurance coverage varies from 50 per cent to 85 per cent of yield and 55 per cent to 100 per cent of price (USDA, Risk Management Agency, 2011).

4.1.1 Farm bill 2014

The 2014 farm bill has repealed direct payments, Countercyclical Payments, Average Crop Revenue Election and Supplemental Revenue Assistance. It brought about changes in the support given to farmers by introducing a few new crop insurance programmes, namely price loss coverage (PLC) and Agriculture Risk Coverage (ARC). Farmers have to make a one-time choice between ALC and PLC. PLC makes payment to producers when the market price

[8] Insurance coverage of USA is the ratio of area insured and total cropland used for crops obtained from Agricultural Statistics, USDA (2016)

of the crop is below a fixed reference price which is fixed in the Agricultural Act of 2014. ARC makes payment when either the farm's revenue from all crops or the county's revenue for a crop (the farmer may choose the alternative) is below 86 per cent of a predetermined or benchmark level of revenue (5-year Olympic average county yield times 5-year Olympic average of national price or the reference price—whichever is higher for each year).

Stacked income protection plan (STAX) is available for upland cotton acreage as they are not eligible for the PLC or ARC plans. It provides coverage for a portion of the expected revenue of the area. Subsidy level of 80 per cent of STAX premium in available to the producers. Besides this, administrative and operating expenses are reimbursed to the insurance agency.

Supplemental coverage option (SCO) provides all crop producers with the option to purchase area coverage in combination with an underlying individual policy**.** Indemnities are paid to farmers when there is a fall in either the average yield or the average revenue per acre to below 86 per cent level.

4.2 Crop Insurance in China

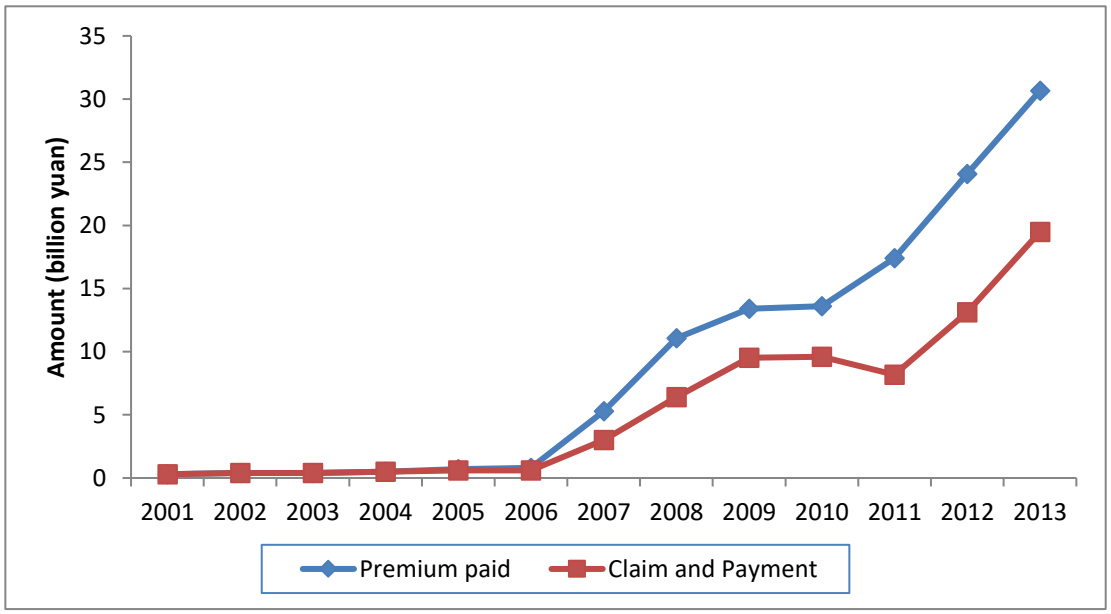
China is one of the few countries in the world which is at risk for a large variety of highly destructive natural disasters. The country is affected by weather calamities such as drought, floods, and hailstorm. According to a report by AIR Worldwide, drought and flood affects 52 per cent and 28 per cent of crop value in China, respectively.

Crop insurance is not new to China as the Peoples Crop Insurance Company of China (PICC) had introduced livestock insurance in the 1950s. Based on the State Council Report submitted by the People's Bank of China (1982), PICC implemented a pilot programme and received a positive response. There was a steep rise in the annual premium from 1982 to 1993 and it covered 29 provinces of China's 34 provinces (including autonomous region and provincial level municipalities). However, the average annual loss ratio[9] in this period was 105 per cent. From 1993 until 2006, the insurance sector in agriculture witnessed a steep fall as the premium amount fell from around 1000 million Yuan in 1993 to around 200 million Yuan in 2006. One of the primary reasons behind this decline was the high loss ratio coupled with the strong market oriented focus of PICC. In 2006, a policy document of the State Council recommended the exploration of a new model on agriculture insurance based on subsidies from both the central and local governments. It also recommended establishing an agricultural reinsurance system with fiscal support from both the central and the local governments. In 2007, the government approved 1 billion Yuan (USD 130 million) towards an agricultural insurance subsidy. This marked the beginning of a new phase of insurance in the agricultural sector in China. Total premium rose from 0.8 billion Yuan (USD 104 million) in 2006 to 5.3 billion Yuan (USD 690 million) in 2007. Since 2007, there has been a steep rise in premium amount and it crossed 30 billion Yuan (USD 4.8 billion) in 2013. In the same period, the total area insured has increased from 15.3 million hectares in 2007 to 73 million hectares in 2013 and 115 million hectare in 2016. Thus, the penetration level has increased

[9] Loss ratio is the ratio between the claims settled by the insurance company and premium paid to the company.

from 10 per cent of the total sown area in 2007 to 45 per cent of the total sown area in 2013 and 69 percent in 2016 In terms of the number of farmers insured, the sale of agricultural policy has increased from 51.8 million in 2007 to 150 million in 2010. The graph below (Figure 2) shows the total premium and claim amounts for the period 2007 to 2013.

Figure 2: Total Premium Paid and Claims Received from Agriculture Insurance (2001-2013)



Source: China Statistical Yearbook, various years

The loss ratio varied between 0.56 and 0.71 indicating the financial viability of the new insurance model. China's crop insurance covers major crops like paddy, corn, wheat and soybean. The programme covers seven natural disasters such as rainstorms, flood, water logging, windstorms, hail, ice storms and droughts. This programme also covers some types of livestock like pig breeding. In 2007, around 14.7 million breeding pigs were insured under the programme and, in 2009, this increased to 52.7 million pigs covering, more than 75 per cent of all breeding-pigs (Wang et al, 2011).

Under the government subsidy programme, the main form of agriculture insurance is yield-based MPCI and the risk assessment is based on district or county yields. The threshold is set at the township's average yield and the sum insured represents 30-40 per cent of production costs for most crops (Swiss Re, 2009).

Weather insurance products are also available and they are modelled as an index of parameters measured on officially recognised weather parameters. The claims are given when there is a deviation measured at officially recognised weather stations.

4.2.1 Government Support in Agriculture Insurance

The Chinese Government intervenes to support agriculture in China through policy reforms and subsidies. In the case of agricultural insurance, government support includes premium subsidies and government reinsurance acts as the last resort. The table below gives the details of premium subsidy provided by the Central and provincial government from the year 2007 till 2013.

Table 9: Premium Subsidy given by the Central and Provincial Government

	Details	Central Government (%)	Provincial Government (%)	Total Subsidies (%)
2007	Maize, rice, wheat, soya, cotton	25	25	50
2008	Maize, rice, wheat, soya, cotton, peanut & rapeseed	35	25	60
2009	Maize, rice, wheat, soya, cotton, peanut & rapeseed	40	25	65
2010	Maize, rice, wheat, soya, cotton, peanut & rapeseed	40	25	65
2011	NA			
2012		40	40	80
2013		40	40	80

Note: Data from 2007 to 2010 are taken from FAO report, data for 2011 is taken from Caixin Online (interview of Xiang Junbo, head of CIRC) and data for 2013 is taken from Global and China Agricultural Insurance Industry Report, 2013-2014.

4.2.2 Agriculture Reinsurance

The government acts as a major reinsurer when the damage to crops is beyond a certain threshold limit. As insurance is growing at a rapid pace since 2007, the reinsurance system was introduced in a few provinces such as Beijing, Henan, Zhejiang and Jiangsu. In Beijing, the municipal government acts as the last insurer and undertakes the remaining liability if the loss ratio exceeds 160 per cent in any year in which catastrophe occurs. In addition, the municipal government purchases reinsurance in private reinsurance market to cover indemnity risk between 160 per cent and 300 per cent; they have established a reserve fund for risk over 300 per cent. In this way, the government caps the indemnity of agriculture insurance policy and introduces a risk sharing policy (World Bank, 2007).

Until 2002, China Re enjoyed the monopoly of being the only reinsurer company in China. After 2002, Swiss Re and Munich Re were given business licences to operate in the Chinese reinsurance market.

4.2.3 AIR Worldwide

Recently, China has tied up with AIR Worldwide and they have developed a cat-loss model. They provide a probabilistic approach to determine the likelihood of losses to the country's major crops: corn, cotton, rapeseed, rice, soybeans and wheat. The model captures the

severity, frequency and location of adverse weather events, taking into account weather variables (such as rainfall and temperature), soil conditions and crop-specific parameters (AIR Worldwide, 2011).

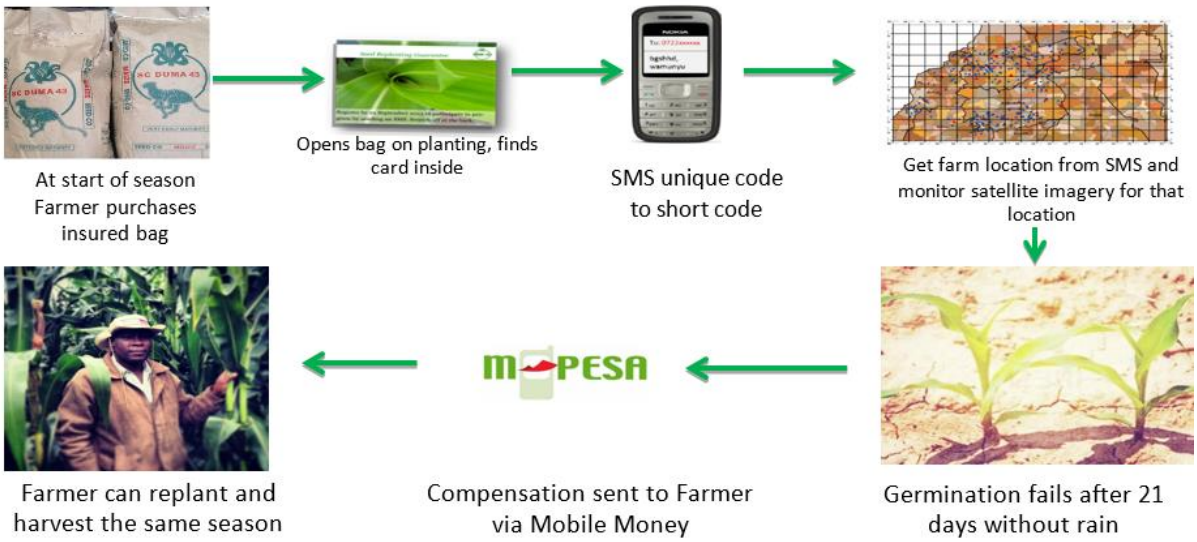
4.3 Crop Insurance in Kenya- Kilimo Salama

Agriculture is the main occupation in the Kenyan economy. Around 70 per cent of the workforce still depends on agriculture for their livelihood. Although traditional indemnity-based insurance products are available to farmers in this region, it has several limitations such as the long time lag in payout of claims, high premium rates and lack of faith in insurance products.

Kilimo Salama (Safe Agriculture) is a weather-index based insurance product developed in 2009 by the Syngenta Foundation for Sustainable Agriculture (SFSA). This was launched in partnership with Safaricom (the largest mobile network operator in Kenya) and UAP (a large insurance company based in Kenya). It insures farm inputs such as seeds and provides complete crop cycle cover for drought and excessive rain. Rainfall is measured using solar powered weather stations and, in case of deviation from normal rainfall, claim payouts are made to farmers. These weather stations are located at a radius of about 15 square kilometres. It monitors rainfall and several other weather parameters such as wind speed, sunlight and temperature and sends data to the central location every 15 minutes using GPRS technology. Since 2012, SFSA has partnered with Columbia University's Earth Institute to ground proof and scale satellite index insurance products.

The foundation has entered into a partnership with Safaricom, which is the largest mobile network operator in Kenya with 80 per cent market share. They developed an application that uses Safaricom mobile technology, M-pesa, to transfer money for claims payout and premiums. Agricultural stockists act as a medium of distribution of insurance products. The farmers are registered with the agro-dealers using barcode which is linked to Cloud-based system. Farmers who purchase insurance embedded seed bags send an SMS to short code with details of unique code, upon which the farmer is automatically registered for insurance. The confirmation message is immediately sent to farmers and they are automatically connected to automated weather stations. Whenever there is a deviation in rainfall, leading to germination failure, the claim amount automatically gets transferred into the accounts of insured farmers. This process does not take more than 4 days and the farmers can use the money for replanting crops. The premium rates vary from 4-13 per cent and this is shared between the farmers and seed companies. The government plays no role in subsidising premium payments.

Figure 3: Representation of Replanting Guarantee



Source: Syngenta Foundation for Sustainable Agriculture (SFSA)

4.3.1 Progress of the scheme

Since its inception in March 2009, the number of insured farmers has gone up from merely 185 to 1.87 lakh in 2013. The amount of premium collected has gone up from USD$543 to USD$1,174,399 in the same period (about USD 1.2 million).

It must be noted that there is almost zero transaction cost in either issuing the policy or in disbursement of claims. This system of claim disbursement via mobile technology is efficient because of timely payout of claims and transparency in claims assessment.

4.4 Lessons for India

India can draw some lessons from some of the best international practices followed by countries such as China, Kenya and the USA. The heavy premium subsidy programme started by the Government of China in 2007 led to an expansion of insured farm area from 15 million hectares in 2007 to 115 million hectares in 2016, covering 69 percent of total sown area. The premium subsidy payable by the government increased from 50 per cent to 80 per cent of the total premium amount. The Kenyan experience is significant due to its efficiency in settlement of claims within 2-4 days. Kilimo Salama (Safe Agriculture) is a weather index based insurance product developed by Syngenta Foundation for Sustainable Agriculture (SFSA) in 2009. They developed an application that uses Safaricom mobile technology, M-pesa, to transfer money for claim payouts. Whenever there is a deviation from normal rainfall resulting in germination failure, the claim amount automatically gets transferred into the accounts of insured farmers. In the USA, the insured area is 300 million acres (about 122 million hectares) in 2015 has increased from 52 percent of cropland in 1998 to 89 percent in 2015. The government subsidy accounts for approximately 70 per cent (including operating and administrative expenses) of the total premium amount. Revenue insurance, which

protects farmers against fluctuations in price and yield, has become the most popular insurance product accounting for 85 per cent of total premium. In USA, crop insurance is sold as a retail product and claims are analysed on the basis of data or productivity of individual plots. It is possible to do it as the average size of landholding is about 174 hectare. India could set up an agency under (Insurance Regulatory and Development Authority) IRDA like RMA in USA to determine premium rates and crops to be insured in different parts of the country.

5. Role of Technology in Crop Insurance

In India, under area based scheme (NAIS, MNAIS and PMFBY) damage is assessed on the basis of CCEs. They are conducted for all notified crops in the notified insurance units to assess the crop yield. Under PMFBY, the minimum sample size of CCEs is fixed at 24 at district level, 16 at the block level, and 4 for major crops and 8 for other crops at the Village Panchayat level. The issues relating to sample size and other technical matters are decided by a technical advisory committee consisting of representatives from Indian Agricultural Statistical Research Institute (IASRI), National Sample Survey Organisation (NSSO) and the Ministry of Agriculture & Farmers' Welfare.

However, there have been problems relating to CCEs from the early years of crop insurance. In the previous insurance schemes such as CCIS and NAIS, there were a number of operational and administrative problems such as the reliability and availability of data on real time basis. Sometimes there is strong local pressure to underestimate the yield of crop as it results in the area becoming eligible for crop insurance claims. The time gap between conducting CCE and settlement of claims is usually very long and the farmers suffer in this process as they may not have surplus money to invest in inputs required in the following season.

Therefore, it is important that remote sensing technology is used that could reduce the time between assessment of crop damage and payment of claim amount. The application of drones and remote sensing satellites at fine resolution can prove to be effective in taking images that could be used by agronomists to assess crop damage in the fields.

5.1 Application of Satellites in Agriculture

Satellite images are increasingly being used to map crop types, estimate crop yield, assess damages for crop insurance and identify locations to conduct CCEs. The images are used in combination with regression/crop models for acreage in many parts of the world.

At present, the major satellite of India, which is used for agricultural applications, is Resourcesat 2. A repeat satellite Resourcesat 2A has recently been launched. Resourcesat has three cameras. They are as follows:

(i) Advanced Wide Field Sensor (AWiFS): This camera provides pictures with a resolution of 56 metres and frequency of about five days.

(ii) LISS III: This camera provides pictures with a resolution of 23.5 metres and frequency of 24 days.

(iii) LISS IV: This provides images with a resolution of 5.8 metres and frequency of 48 days.

Besides these Indian satellites, data from Sentinel (European satellite) and Landsat (American satellite) are also used for crop estimation.

One major challenge in the usage of satellite images is frequent obstruction by clouds in Kharif season in the optical type of sensors (the sensors which operate in visible and infrared region). These are overcome by the use of microwave satellites as they are able to capture images even on cloudy days. However, the use of this technology has been successful for assessment of paddy and jute crops.

5.2 Application of Drones in Agriculture

Drones or UAVs (Unmanned Aerial Vehicles) have been in use by the armed force since the 19th century. However, now their use has been extended to other sectors such as customer product delivery, oil and gas, search and rescue, agriculture and crop management, and media and entertainment. With advancement in technology and its vast usage, it is expected that the projected annual sales of these unmanned vehicles will increase from around 40,000 in 2015 to 1,25,000 in 2020 (Cognizant Report on Drones, 2014). These are light-weight units, typically ranging from two to fifteen pounds, and have flight duration ranging from 40 to 200 minutes. They are operated manually, have high resolution cameras, and they can capture pictures and video and share information on a real time basis. According to an article in USA Today, the Association for Unmanned Vehicle Systems International, the trade group that represents producers and users of drones and other robotic equipment, predicts that 80 per cent of the commercial market for drones would eventually be for agricultural uses.

Drones will have a significant role in agriculture and they will help increase efficiency in a number of ways. The practice of identifying problems based on specific areas is called precision farming, which has become popular through the use of drones. This enables farmers to use resources such as pesticides and fertilisers more efficiently, and apply it only to focused areas. In Japan, around 2400 unmanned helicopters are being used to spray fertilisers and pesticides to 40 per cent of its rice fields. They are also being used in farms of wheat and, soybeans and pine trees in South Korea (Jack Nicas, Wall Street Journal, 2014).

With the help of technological advances, tiny MEMS sensors (accelerometers, gyros, magnetometers, and often pressure sensors), small GPS modules, incredibly powerful processors, and a range of digital radios are available at low a cost due to their wide usage in smart phones and consequent economies of scale. Drones are helpful to farmers in providing a bird's eye view of their land. They help in viewing a crop from the air and can reveal various patterns like irrigation problems, soil variations, fertiliser requirements, etc.; they can even track down lost livestock. With the help of airborne cameras and through images taken by them, it is possible to identify the difference between a healthy and distressed plant which

is not visible to the naked eye. It is also possible to create time series data within several time periods to help in better crop management.

UAVs could be used to assess crop damage and enable faster settlement of insurance claims and payouts. It can take images of crop damaged by hail, wind, rainfall, etc. As they fly at low heights, problems such as cloud obstruction that occur in the case of remote sensing satellite images can be avoided to a large extent. They could be proactively positioned in areas prone to damage. As soon as there is information on damage in a particular area, they could be deployed to assess the damage on site so that accurate information is captured on time.

Several countries such as Canada, Australia, Japan and Brazil have already been using drones in agriculture. As early as in 1983, the Ministry of Agriculture, Forestry and Fishery of Japan had put forward a request for the development of an unmanned helicopter for agriculture. The Yamaha R-50 with its payload of 20 kg was the first practical, unmanned helicopter for crop dusting. The government announced a formal policy promoting the use of unmanned helicopters in 1991 for rice farming. In 2001, the total area of farmland being sprayed by RMAX unmanned helicopters reached 310,000 hectares and they are being used in agriculture areas for tasks including planting, weed management, fertilising and pest control (Yamaha RMX,).

In USA, the Federal Aviation Administration (FAA) has recently given the approval for usage of drones in agriculture. Following this, the world's largest corn processor Archer-Daniels-Midland Co. received approval to use UAV to assess crop damage. This will enable to expedite the process of crop insurance. Other insurance companies such as AIG, USAA and Erie Insurance Group have also obtained approval from the FAA to operate drones to assist in their claims, risk assessment and underwriting practices.

In 2014, Skymet along with the Agriculture Insurance Company of India Limited (AIC) and the Gujarat government conducted a pilot project using satellites and drones for the groundnut crop. They were able to capture images a few centimetres away from the farmland, which was not possible with the use of satellites. As the landholdings are small and there is multiple cropping, such technology may be able to help in improving the estimation of the yield of crops. States with digitised land records could benefit from this technology. These UAVs can take images that can be superimposed on digital maps of states and help identify farms and crops sown.

5.3 Low Earth Orbits (LEO)

LEO satellites are micro satellites weighing less than 500 kilogram at a height of 200 kilometres to 1200 kilometres above the earth surface. They travel at a speed of 28,000 km per hour and are capable of completing a rotation around the earth in 90 minutes. China has launched 100 satellites in 2014 and they have launched another 150 satellites in 2015. With LEO satellites, images of vegetation could be captured to enable monitoring of crop growth

around the world. India could launch also such micro satellites that could be used for assessing crop damage.

5.3.1 Planet Labs

Planet Labs is an organisation based in San Francisco, engaged in space and information technology. They design, build and operate satellites that are called "doves". In 2014, they delivered Flock 1, the world's largest constellation of earth-imaging satellites made up of 28 doves. They subsequently launched more satellites totalling 71 doves that take images of the entire earth, every day. In February 2017, Planet Labs launched 88 satellites on an Indian PSLV rocket and they hope to complete the constellation of tiny birds that will let it image the whole planet daily with high resolution. They fly on low orbit and collect data from any place on earth and this is significant in solving commercial, environmental and humanitarian challenges. They make contact with the ground station, receive images and migrate to clouds. The resolution is 3-5 m and each image is processed through their automated data pipeline and delivered to customers via web tools. At present, they are used in areas such as monitoring of crops, urbanisation, natural resources, asset management, logistics and site development. As the satellites go into orbit, they take 90 minutes to complete a full circuit.

5.4 Government of India's Programmes of use of Satellite Data for Agriculture

Government of India, Ministry of Agriculture & Farmers' Welfare has launched many programmes to use satellite data for agricultural applications. Under the FASAL (Forecasting Agricultural output using Space, Agro-meteorology and Land based observations) project pre-harvest production district/state/national forecasts are given for 8 major crops using optical and microwave (for rice and jute) remote sensing data. Agricultural drought assessment is carried at district/sub-district level using data of multiple satellites and other collateral parameters under NADAMS (National Agricultural Drought Assessment and Monitoring System) project. Production assessment of 7 major horticultural crops is carried out using satellite data under the CHAMAN (Coordinated Horticulture Assessment and Management using geo-informatics) project. The efficacy of use of satellite data for improvement in yield estimation towards crop insurance is being explored through pilot studies under the KISAN (C [K] Crop Insurance using Space technology and geo-informatics) project.

5.5 Remote sensing-based Information and Insurance for Crops in Emerging Economies (RIICE)

RIICE is a public-private organisation that aims to reduce the vulnerability of small rice farmer in low-income countries in Asia and beyond. The countries that have a large area of land under cultivation and a large per capita consumption of rice in Asia are selected by the organisation. These countries include Bangladesh, Cambodia, India, Indonesia, Philippines, Thailand and Vietnam.

RIICE has partnered with the European Space Agency (ESA) and other providers to scan the earth surface using radar-based sensing technology. The radar based-remote sensing[10] data, used in RIICE, have a high spatial resolution and high temporal resolution. It can detect the growth of rice at a resolution of 3 by 3 metres. It is capable of taking data from the same spot every few days as it circles around the earth. The data is stored in a map format and in numerical tables, with the administrative unit at village level. The growth of rice is mapped in three stages that include the sowing, growing and flowering stage. With this technology, it is easy to identify the extent of damage of crops caused by droughts and floods. They are particularly useful to government and policymakers in making decisions regarding trade related issues and insurance company in calculating risks of yield losses. The insurance products are delivered with the help of rural banks and co-operative institutions.

6. Conclusions and Policy Recommendations

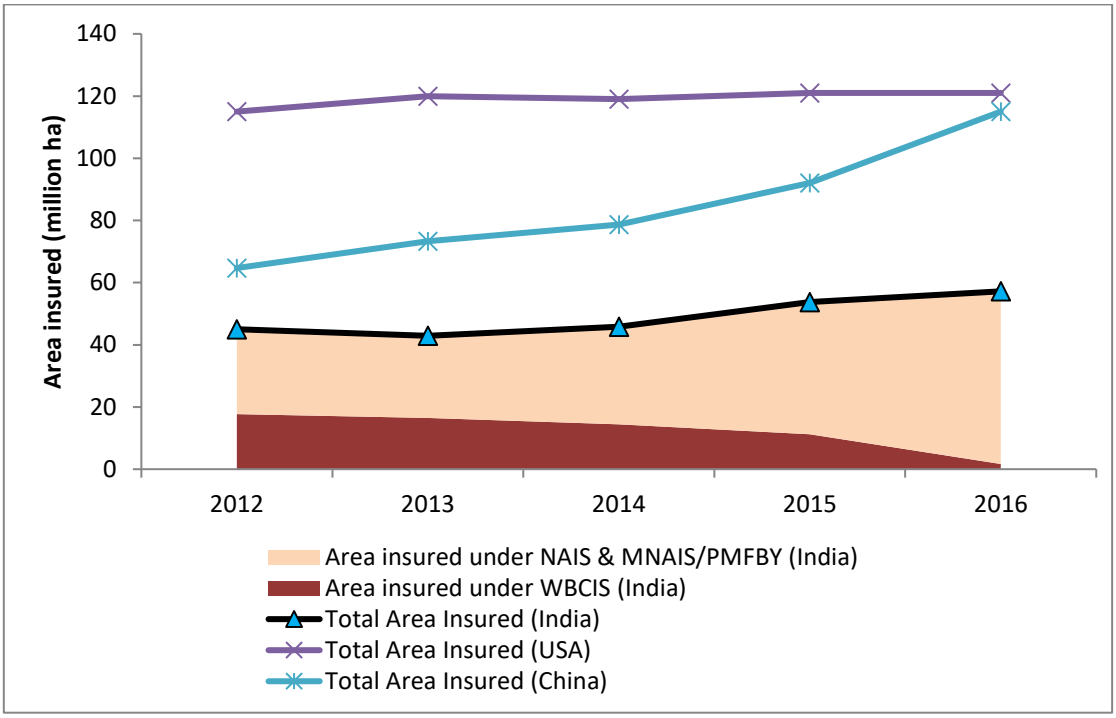
Crop insurance has been in the country since 1972, yet it is beset with several problems such as lack of transparency and non-payment/delayed payment to farmers. Until recently (till March 2016), there were three crop insurance schemes operating in India – NAIS, MNAIS and WBCIS. However, it met with limited success due to high premium rates of 8-10 per cent under MNAIS and WBCIS, delay in settlement of claims, which took around 6 to 12 months, inadequate sum insured and their capping under MNAIS and inadequate government support in the form of premium subsidies, had left a vast majority of farmers without any significant insurance coverage. Realizing the limitations existing system of crop insurance, the government launched a new crop insurance scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY) in Kharif 2016. In this paper, we have made an attempt to evaluate the performance of the scheme for the year-2016-17. The broad conclusions and policy recommendations that emerge from the analysis of Section 2, 3, 4 and 5 are as follows:

Low penetration of agricultural insurance

The penetration of agricultural insurance in India is still low in terms of the area insured and the number of farmers covered. In three year period (2013-14 to 2015-16), the average area insured under all the schemes was around 47 million hectare and the number of farmers insured was 39 million. With the implementation of PMFBY both area insured (in hectare) and farmers covered have increased to 57 million. In total, area covered in 2016-17 accounts for about 30 percent coverage to gross cropped area in the country, less than half of what USA (89 percent coverage) and China have achieved (69 percentage coverage) (Figure 4). The first year target of 30 percent coverage in terms of area insured has been achieved and the government aims to cover 40 percent in 2017-18. In this context, we would like to highlight that 27 percent coverage was already achieved in 2015-16 even without the implementation of the scheme. So, there is a long way to go if India has to scale up its crop insurance sector like USA or China. To achieve this, it is critical to 'fix the system' for greater transparency, accuracy, and timeliness, as it is scaled up.

[10] Radar-based sensors have an advantage over optical observation as the obstructions of clouds in mapping and monitoring of earth can be avoided.

Figure 4: Area under Crop Insurance in India, China and USA[11]



Source: Agricultural Statistics at a Glance (various years), Industry data, USDA and Krychevska (2017) for China

Premium administration related issues

Crop insurance is one of the largest items of expenditure in the central budget. Out of total expenditure of Department of Agriculture Cooperation and Farmers' welfare, of Rs 36,912 crore in 2016-17, the expenditure on crop insurance as premium subsidy was Rs 11,051 crore. Thus it has taken away almost one-third of allocation. Crop insurance is the third largest segment in non-life insurance sector after motor and health insurance. The scheme is administered by credit and insurance division under a joint secretary in the Department of Agriculture, Cooperation and Farmers' Welfare, GoI, who is assisted by two directors. The joint secretary and directors are transferrable to other ministries or state government. The only person who has continued in insurance section in the department is an Assistant Director. Even in the Agriculture Insurance Company of India, there was no regular Chief Managing Director from March, 2016 to May, 2017 when PMFBY was being implemented in its very first year. Such a large and important scheme deserves a dedicated team of professionals, both at the centre and in the states, which can collate and analyse the data collected from the states and insurance companies. This team should also hand hold the officers in State Government in documentation of crop insurance scheme. Since GoI bears 50 percent of premium subsidy, it is necessary that the actuarial rates received in tenders are compared with rates of similar clusters and appropriate lessons are learnt and shared with

[11] Years 2012, 2013, 2014, 2015, 2016 refers to 2012-13, 2013-14, 2014-15, 2015-16 and 2016-17, respectively, for India.

states. On the basis of historical loss cost, attempt should be made by this professional team in GoI to estimate actuarial premium for each cluster. This professional team should also regularly update the insurance portal so that insurance companies, farmers, researchers and NGOs can have access to the progress of scheme and its usefulness to farmers. Similarly the State government also need to engage two or three professionals in their crop insurance cells to analyse data generated at various levels. This can help in reducing premium rates in future.

Costing of Insurance Scheme-Premium subsidy

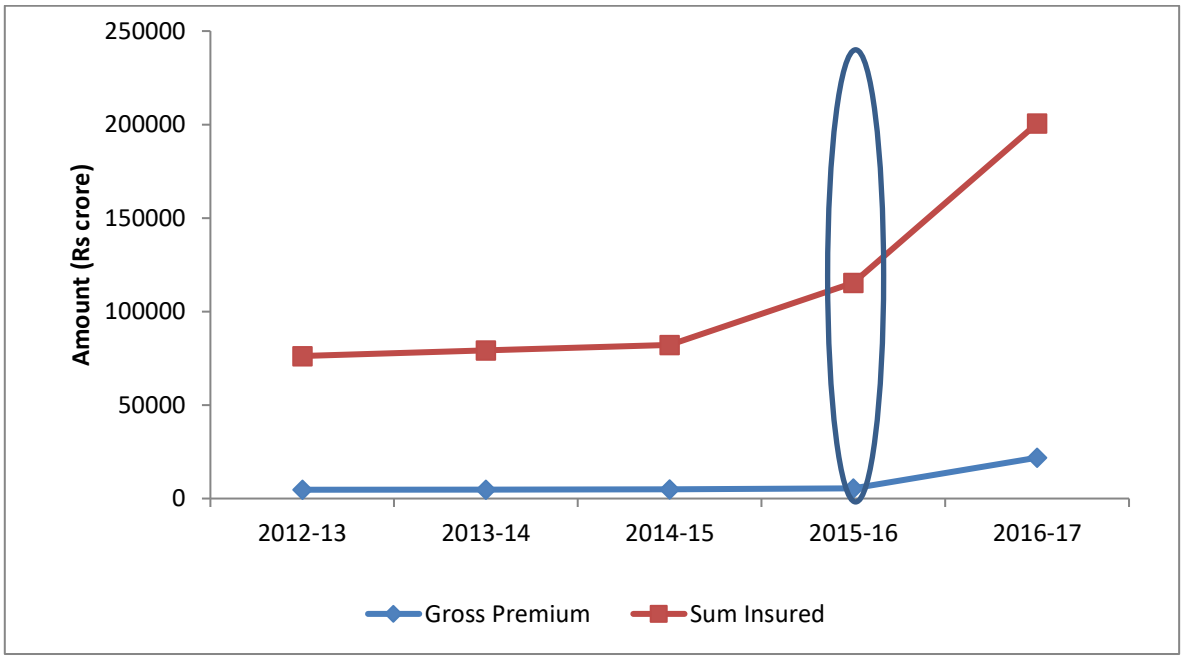
Premium on crop insurance is highly subsidised under PMFBY by the Central and State government which is in line with international experience. Learning from the international experience, it is clear that penetration of agricultural insurance increased only after the introduction of heavy subsidy (80 percent) by the Government of China and 70 percent (including administrative expenses) in USA. In this context, the Indian government must be complimented for taking a bold step and reforming crop insurance.

The gross premium stands at Rs 21,882 crore in 2016-17 (increased by 298 percent since 2015-16) and about 83 percent of this amount is subsidised by the State and Central government. As agriculture is increasingly becoming risky for farmers, the actuarial premium rates under PMFBY in Kharif 2016 are very high and the government will have to continue subsidising premiums paid by farmers. Expanding area insured should lead to a substantial decrease in premium rates (at least upto 8 per cent) provided strict discipline is adhered to and the scheme is implemented as per its operational guidelines.

Even assuming that the premium falls from 12.5 per cent to 8 per cent, as the scale of insured area increases to 100 million hectares, and that the sum insured is, say, Rs.40,000/ha, the total premium subsidy required by the Central Government will be Rs.12,000 crore for 100 million hectares covered (Annexure 9).

The premium rates are calculated on actuarial basis under MNAIS and WBCIS which was a departure from the administrative premium rates, fixed by the GoI that prevailed during NAIS. Under MNAIS, the premium rates were capped in certain cases and the sum insured per hectare was reduced to an amount commensurate with capped premium rates. Due to high premium rates, the sum insured was very low in many districts. Under PMFBY, there is no capping on premium rates and sum is insured it to be fixed based on the Scale of Finance. With the removal of capping on premium rates, sum insured almost doubled in 2016-17 (Figure 5). But even under the new scheme, sum insured is based on scale of finance as assessed by DLTC which covers only cost of cultivation.

Figure 5: Gross Premium and Sum Insured (all schemes combined) under Crop Insurance



Source: Agricultural Statistics at a Glance (various years) and Industry data

Implementation issues related to PMFBY- cut off dates, yield data submission and premium subsidy

The scheme can fly high only if operational guidelines are strictly followed and cut off dates are not extended frequently.. One of the reasons for high actuarial premium rates quoted by the reinsurance companies in Kharif 2016 was the extension of cut off dates. Such extensions leads to the problem of adverse selection and companies quote high premium rates to cover their losses. For example, Bihar encountered excessive rainfall and flood during Kharif 2016. The tender was floated when the flood situation was already known. Thus, both insurance and reinsurance companies quoted very high actuarial rate of 17 percent. There should never be any extension of cut off dates under any circumstances.

Timely submission of yield data on CCEs to insurance companies by the state governments is critical to the success of PMFBY so that they can make faster settlement of claims to farmers in case of reduction in crop yield. Also insurance companies face delays in receiving premium subsidy from State government and Government of India. This should be done efficiently so that insurance companies could make timely settlement of claims. This may also result in insurance companies quoting lower actuarial premium rates in future.

The data on initiation and finalisation of tender date, sum insured for each crops, actuarial premium rates, payment of premium subsidy by GoI and state governments, submission of yield data by state government, claim accepted and paid by the insurance companies should be released by the government every month. This will enable to increase transparency and improve efficiency of crop insurance program. The recently launched insurance portal is an

appreciable initiative as it will help in analysis of insurance data by government officers, researchers and insurance companies.

In this context, we would like to highlight the case of Tamil Nadu which experienced one of the worst droughts in 2016-17, resulting in substantial crop damage. As the yield data on CCE for Rabi 2016-17 was furnished to insurance companies on time and premium subsidy was paid by the State government, farmers received timely claims for their crop damage. Being a drought season, premium to claim ratio was high at 1.96 in Rabi 2016-17. Thus, Tamil Nadu stands as an outstanding example that can be emulated by other states to show them that it is possible to make claim settlements on time.

Procedure for making assessment of crop damage

Optimizing CCEs

In the operational guidelines of PMFBY, the use of mobile based technology with GPS stamping has been mandated to improve the quality of data and make faster assessment of claims. Unfortunately, even after almost two years of the implementation of the scheme, mobile devices have not been procured to make smart assessment of crop yield. Our discussions with experts reveal that there were allegations of data manipulations in some cases while conducting CCEs. For example, it is claimed that the yield of groundnut of Rajkot district in Gujarat in Kharif 2016 was largely underestimated that made the insurance companies liable to pay exaggerated claims from farmers.

We recommend conducting, monitoring and evaluating a small number of high quality CCEs. This should be supervised and monitored by independent experts from state agricultural universities and Krishi Vigyan Kendras. The use of satellites to identify farmland for conducting CCEs is recommended to promote transparency and minimise the CCEs. Satellite images could be used to determine broad location of CCEs, determination of area sown to validate area insured and it may be possible to conduct CCE in areas which are prone to higher losses. Use of handheld devices and mobile phones to capture multiple images in case of heterogeneity of field conditions in a village could be beneficial in assessment of damage.

Karnataka has gone ahead as they have made Samarakshane portal. Not only does this portal provide information related to CCE but other information such as claim statements, farmer-wise including farmer’s Aadhaar number and account number. Mobile phones have been made mandatory for CCE. Other states should design similar portal like Karnataka and provide complete information of CCE, use of technology, updating of pictures from CCE and provide timely information to insurance companies and also involve them in CCE.

Satellite/Drone Images

Use of drone/satellites could be a potential break through and 'realistic crop insurance' could be made possible by leveraging on technology and having minimal reliance on human intervention. Satellites and drones provide imagery data for assessing agriculture damage. Collaboration with ISRO and satellites from other countries could play a significant role in

increasing the frequency of images captured for assessment of damage. Some experts in this area have suggested that there is requirement of a constellation of five satellites both using optical and microwaves technology, dedicated to crop insurance which would enable a resolution of 5-10 metre within a frequency of 5-10 days. The average cost estimated for of these satellite is Rs 400 crore (approximately) and it would require approximately Rs 2000 crore to set up this constellation.

Drones could also be used for providing images for assessing crop damage. As they fly at low heights, the data could be captured with greater accuracy and the problem of cloud obstruction can be avoided. They could be used to make quick assessment of localised hailstorms, flood, etc. However, flying of drones in the country needs many official clearances, which is time consuming. A single window clearance mechanism must be made available to make wide scale usage of drones for agriculture in India.

To achieve greater accuracy in assessment of damage, large scale pilot studies need to be carried out with the support of ISRO and Mahalanobis National Crop Forecasting Centre of Ministry of Agriculture & Farmers' Welfare. Funding and human resources support is essential for carrying out these pilot studies.

Scaling up WBCIS-Expanding Automatic Weather Stations and Rainfall Data Loggers

Under WBCIS, there has been a substantial decline in area insured to 1.3 million hectare in Kharif 2016 as compared to 6.3 million hectare in Kharif 2015. The primary reason for this decline was the faulty product design where there is no correlation between temperature and other triggers in the weather station and yield calculation, manipulating temperature at the weather station causing "trigger" and prompting claim payments. If these issues are corrected and India could follow Kenya's model of settling insurance claims within 2-4 days from the occurrence of the event, WBCIS could be a success.

In order to get accurate data of rainfall, we have to plan to set up automatic weather stations (AWS) and rainfall data loggers at the block level. In order to cover the entire country, one block would require five automatic weather stations (AWS) and under each AWS, there should be five rainfall data loggers[12]. The total cost is estimated be Rs.332 crore-1420 crore to cover the entire country with weather stations.

There is need to have a proper quality check for both the instruments and the sighting of the instruments. Additionally, there is requirement of regular maintenance of the weather stations. However, Weather based crop insurance scheme can be successful only if term

[12] The cost of one AWS is Rs 50,000 and the cost of a rainfall data logger is Rs 10,000, therefore one set of AWS and rainfall data loggers for one block will cost Rs. 5 lakh.
For 6500 blocks, we would require 33000 AWS and approximately 170,000 rainfall data loggers. We already have 9000 AWS in the country; hence, we would require approximately 25000 AWS and 170,000 rainfall data loggers. According to the specifications regarding weather parameters required by WBCIS, the cost of each AWS is Rs. 65,000. However, as per MAHAWEDH project launched by the Government of Maharashtra, the cost of AWS is estimated to be around Rs 5,00,000. Costs of 25000 AWS is Rs.162 crore-Rs 1250 crore. Cost of 170,000 rainfall data loggers is Rs.170 crore

sheets are prepared by professionals under the supervision of agricultural universities without any undue influence of local politicians. The term sheets should reflect the local weather conditions. An independent agency such as State Agriculture Universities and ICAR institutes is required to be deeply involved for this purpose. Weather based insurance products can provide quick claim to farmers if term sheets are unbiased and weather stations are well managed.

Procedure for settlement of claims to farmers under WBCIS

Based on the Kenyan model of agricultural insurance, primarily for weather insurance, the stockist (seed and fertiliser shops) could act as distribution channels for selling insurance products. The farmers could purchase an insurance cover by paying the premium amount. This can be made available in the form of scratch cards. Crop specific scratch cards (premium) could be made available in the market. These cards can be in different acreage denominations (up to 1 ha; 2 ha; etc.)**.** The farmers could then send an SMS using the number mentioned on them.

In case of adverse weather conditions, farmers would receive compensation and the amount could be directly credited into their bank accounts. This amount could be used to replant and harvest their crops in the same season. This kind of technology ensures transparency, timely payment of claims and satisfaction among farmers.

Digitised Land Records – Linking with bank accounts, Aadhaar UID and mobile numbers

The land record of the farmers should be digitised and linked to their bank account. The claim amounts could be transferred to farmers' bank accounts linked with Aadhaar along with their mobile numbers. This system can enable faster settlement of claims within two **weeks** of crop damage due to certain reasons like hail where assessment is possible without CCEs.

Role of private players

The private sector has an important role to play in enlarging crop insurance programme in the country. Private sector participation could lead to greater efficiency in the system through faster settlement of claims and less distortion in allocation of government subsidy. As envisaged in the operational guidelines companies could be allocated states/districts based on tender proceedings for a period up to 3 years. It will induce competitiveness in this sector and this could significantly lower the cost of providing insurance coverage to farmers.

Raising awareness and satisfaction among farmers

It is generally said that the farmers lack faith in the current insurance system. They have little knowledge on sum insured, premium rates, etc. The time period taken for assessment of claims make the product unattractive to them. There is need to create awareness among farmers through government agencies, insurance companies and banks. Farmers should receive an SMS as soon as they purchase the insurance product so that they are well informed about compulsory deduction of premium, the amount of sum insured and procedure of claim

settlement. There is need to create excitement around the scheme as was done in the cases of the PM Suraksha BimaYojana and PM Jan DhanYojana.

In sum, GoI has taken a bold step to revamp its crop insurance schemes and move towards PMFBY. It is a step in the right direction, but for it to be beneficial to farmers and at low cost to the government exchequer, it has to overcome several implementation glitches. It has to build trust through greater transparency, by applying high technology, regularly sharing relevant data on insurance portal, adhering to timelines for cut-off dates for registration as well as conducting CCEs within stipulated time mentioned in operational guidelines, and video recording those. Only then premiums will come down, and so will the subsidy burden to government, and timely benefit of settling claims of farmers.

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Annexures

Annexure 1:

National Agriculture Insurance (NAIS)

NAIS was introduced in Rabi 1990-2000, leading to the discontinuation of CCIS. Like CCIS, this was primarily based on area approach. It was available in all states and union territories and covered all farmers and sharecroppers and tenant farmers growing notified crops in notified areas. The crops covered in the scheme included food crops, oilseeds, annual commercial/horticulture crops.

Area Approach and Level of Indemnity

The scheme was based on an area approach, i.e., a defined area[13] for each notified crop and on an individual basis for localised calamities such as hailstorm, landslide, cyclone and flood.

Three levels of indemnity, viz. 90 per cent, 80 per cent and 60 per cent, corresponding to low, medium and high-risk were available for all crops based on the coefficient of variation in yield data over the previous 10 years.

Farmers Covered and Sum Insured

The scheme compulsorily covered loanee farmers, whereas it was voluntary for non-loanee farmers. The minimum sum insured in case of loanee farmers was the amount of crop loan availed from the bank. There was an option to extend sum insured up to the value of threshold yield[14] of the crop insured. Where the value of the threshold yield was lower than the loan amount per unit area, the higher of the two was the sum insured. If loanee farmers wished to opt for a higher sum insured (upto 150% value of average yield in the notified area) they had to pay premium at actuarial rate as notified by the State Government.

For non-loanee farmers, the sum insured was up to the value of threshold yield of the insured crop. For sum insured up to 100 per cent of threshold/average yield of the notified area, the farmers paid normal subsidised premium but sum insured above 100 per cent and up to 150 per cent of the value of average yield was without any premium subsidy from the Govt.

Premium Rate and Premium Subsidy

The premium rates for farmers were 3.5 per cent for oilseeds and bajra, 2.5 per cent for cereals, millets and pulses during Kharif and 1.5 per cent for wheat, 2 per cent for other food crops and oilseeds during Rabi. The actuarial rates applied for annual commercial/horticulture crops. In case the actuarial rates were less than the premium rates, then the former was taken into consideration for calculating the premium.

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[13] Defined area may be a gram panchayat, mandal, hobli, circle, phirka, block, taluka, etc. to be decided by the state/UT government.

[14] The value of threshold yield is based on moving average yield of the past three years in the case of rice and wheat, and five years' yield in case of other crops, multiplied by the level of indemnity.

Premium for small/marginal farmers were subsidised to the extent of 50 per cent, to be shared equally between the centre and the states. The subsidy on premium was to be phased out over a period of five years, which would be reduced by 10 per cent each year. However, 10 per cent subsidy continued to be given till the end.

Sharing of Risk

The risk was shared by implementing agency[15] (IA) and the government in the following proportion: The risk of IA in meeting claims was restricted to 100 per cent in case of food and oil seeds. Thereafter, all normal claims up to 150 per cent of the premium were to be met by government and claims beyond that were to be paid out of a corpus fund.[16] In case of commercial/horticulture crops the IA will bear all normal losses, i.e., up to 150 per cent of the premium and beyond this limit, claims will be paid out of the corpus fund.

Calculation of claims

An insured crop in a notified area that recorded actual yield lower than the threshold yield (i.e., guaranteed yield), automatically became eligible for compensation or claims. All the insured farmers growing that crop in the defined area were deemed to have suffered shortfall in their yield. Indemnity was calculated using the formula:

(Shortfall in Yield/Threshold Yield)* Sum Insured for the farmer

Shortfall in Yield=Threshold Yield - Actual Yield for the defined area

In case of localised risk, where settlement of claims was based on individual basis, compensation was calculated by the IA in co-ordination with state/UT government.

Due to the shortcomings of NAIS, the government decided to launch a new scheme called the National Crop Insurance Programme (NCIP) in 2013, which consisted of three components.

(i) Modified National Agricultural Insurance Scheme (MNAIS)

(ii) Weather Based Crop Insurance Scheme (WBCIS) &

(iii) Coconut Palm Insurance Scheme (CPIS)

This scheme was to start with some improvements for full-fledged implementation from Rabi 2013-14 seasons. However, on representations from several states, NAIS was continued during 2013-14 and 2014-15.

[15] Agriculture Insurance Company of India (AIC) Ltd. was the Implementing Agency for NAIS.

[16] To meet catastrophic losses, a corpus fund was created with contributions from the Government of India and the states/UT on 50:50 basis managed by IA.

Modified National Agriculture Insurance Scheme (MNAIS)

The Government of India implemented MNAIS on a pilot basis in 50 districts from the Rabi 2010-11 season onwards, with some additional features that were lacking in NAIS. It included a reduction of the insurance unit to the panchayat level, calculation of premium based on actuarial rates, raising the minimum level of indemnity to 80 per cent from 60 per cent, a more refined basis for calculation of threshold yield, etc. These improved features are discussed in detail below. From Rabi 2013-14, MNAIS became a part of NCIP and NAIS was to be discontinued but several state governments represented to GoI for continuation of NAIS. The GoI allowed NAIS to continue in several states including Gujarat, MP, Odisha, Chhatisgarh, Jharkhand, Maharashtra and TN. A few states, including UP and Rajasthan however switched to MNAIS from 2013-14.

Insurance Unit

The insurance unit was village/village panchayat or any other equivalent unit for major crops, and for other crops, it could be a unit between the village panchayat and taluka. The unit will be decided by the state/UT government.

Level of Indemnity and Sum Insured

Two levels of indemnity, viz., 90 per cent and 80 per cent, were available for all crops. The threshold limit in an insurance unit was the average of seven years [excluding a maximum of two years in which a calamity, such as drought etc., was declared by the concerned authority of the government].

For loanee farmers, the sum insured was equal to the amount of crop loan sanctioned/advanced, which could be extended up to the value of threshold yield at the option of the farmer. The value of sum insured was arrived at by multiplying the notional threshold yield with the MSP. The farm gate price, established by the marketing department /board was to be adopted for crops for which MSP was not declared.

Farmers who had voluntarily opted for crop insurance, the sum insured was up to the value of threshold yield of the insured crop.

Premium Rates and Subsidy

Under MNAIS, the premium rates were determined on actuarial basis instead of the administered rates in the earlier scheme. However, in order to save Govt expenditure on subsidising the premium, the same were capped at 11 per cent and 9 per cent (of sum insured) for food and oil seeds crops for Kharif and Rabi season respectively. And for annual commercial/horticulture crops, it was capped at 13 per cent. In case of crops whose premium were higher than the cap level, sum insured was reduced to cap level whereas the actuarial rates continued to apply. The actuarial premium was subsidised by the government in the following manner:

Premium Subsidy given by the Government under MNAIS

S No.	Premium Slab	Subsidy by Central and State Government on 50:50 basis and premium payable by farmers
1	Up to 2 %	Nil
2	>2% - 5%	40% subject to a minimum net premium of 2%
3	>5% - 10%	50% subject to a minimum net premium of 3%
4	>10% - 15%	60% subject to a minimum net premium of 5%
5	>15%	75% subject to a minimum net premium of 6%

The above table shows that premium subsidy up to 75% was available to all farmers. The difference between the actuarial (gross) premium and the premium payable by the farmer, i.e. premium subsidy, was shared equally between the Government of India and state government.

The calculation of indemnity was to be done in the same manner as NAIS.

Apart from these features, on account settlement of claims up to 25 per cent of likely claims was to be released in advance in case of adverse seasonal conditions. There was an option now available for claims under prevented sowing/planting category if farmers in one insurance unit are not in a position to either sow or transplant or grow a crop (failed at an early stage). When this incidence is widespread, i.e., a major portion of the area in one insurance unit remains unsown or sowing fails, (say, more than 75 per cent of normal area) or as decided for various crops by SLCCCI at the time of notification, then the insurance company based on weather/rainfall position in the insurance unit as issued by concerned office of IMD during the season, and acreage sown details received from the state government, shall decide the extent of claims to be paid. Post-harvest losses are available for those crops that are allowed to dry in the field up to a maximum period of two weeks from harvesting.

Reinsurance Cover

The implementing agency was required to make efforts to obtain appropriate reinsurance cover in the national/international reinsurance market. The government provided protection in case of failure to obtain reinsurance cover as well as in cases where the premium to claim ratio exceeded 1:5. A ‘Catastrophic fund’ to which the centre and state governments would contribute equally was to be created.

Weather Based Crop Insurance Scheme (WBCIS)

This scheme started its operations on a pilot basis in 2007-08 based on "area approach". It aimed to protect farmers against crop losses on account of adverse weather conditions such as deficit and excess rainfall, frost, heat, relative humidity, etc. Amongst the various weather parameters like rain, temperature, wind, sunshine, etc., rainfall is the most important parameter in the context of Indian agriculture, particularly in the Kharif season. This scheme compensated anticipated loss in crop yield resulting from adverse rainfall incidence such as deficit rainfall or excess rainfall.

Area Approach

For the purpose of compensation, a 'reference unit area' (RUA) is deemed to be a homogenous unit of insurance. Each RUA is linked to a reference weather station (RWS), on the basis of which current weather data and the claims are processed. Such RUA was restricted to a 10-km area around the RWS in the case of rainfall and wind parameters, and 100 km in the case of other weather parameters such as frost, heat and relative humidity. Claims arose due to certain deviation in weather conditions. When the 'actual temperature' within the time period was more or less as compared to the specified "temperature trigger", then all insured farmers in the specified RUA were deemed to have suffered the loss. This scheme was compulsory for loanee farmers and voluntary for non-loanee farmers.

Sum Insured

Sum Insured was broadly equivalent to the 'cost of cultivation' and pre-declared by the insurers. Here, the sum insured for an individual cultivator would be the product of sum insured per hectare and the area under cultivation as declared by the cultivator.

Premium Rate and Premium Subsidy

The premium rate was calculated on the basis of actuarial rates. However, premium rates were capped at 10 per cent for Kharif and 8 per cent for Rabi food crops and oilseeds and 12 per cent on commercial/horticulture crops. In case of the crops whose premium was higher than the cap level, their sum insured would be reduced to cap level where the actuarial rates continued to apply.

The premium subsidy available to the farmers, shared equally between the central and state government are as follows:

Premium Subsidy given by the Government under WBCIS

SL.	Premium Slab	Subsidy to Farmers
1	Up to 2%	No Subsidy
2	>2 – 5%	25%, subject to a minimum net premium of 2.00%
3	>5 – 8%	40%, subject to a minimum net premium of 3.75%
4	>8%	50%, subject to a minimum net premium of 4.80% and maximum net premium of 6%

Payout of Claims

Payout would arise only in adverse weather incidents when there was deviation between trigger weather[17] and actual weather data recorded at reference weather stations. It would be responsibility of the insurance companies to make payments for losses arising out of adverse weather conditions.

[17] Trigger weather is a predefined weather parameter applicable to a notified crop in a notified reference unit area.

Annexure 2:

State	No of Farmers Insured (in 000s)				
	Kharif 2012	**Kharif 2013**	**Kharif 2014**	**Kharif 2015**	**Kharif 2016**
Andaman & Nicobar	0.6	1.0	0.7	0.6	0.0
Andhra Pradesh	2618.5	2228.0	261.0	1519.2	1618.5
Assam	34.8	34.1	24.7	31.5	51.7
Bihar	1615.8	1861.8	2298.3	1655.2	1485.4
Chhattisgarh	1182.2	650.6	974.2	1203.9	1399.2
Goa	0.3	0.3	0.2	0.1	0.7
Gujarat	1143.9	1005.1	658.9	502.2	1842.3
Haryana	108.1	122.2	0.0	0.0	738.8
Himachal Pradesh	17.7	11.8	17.4	28.8	134.6
Jammu & Kashmir	3.8	4.5	1.4	0.0	0.0
Jharkhand	497.8	334.5	193.9	536.1	828.4
Karnataka	859.6	600.5	1076.0	872.1	1725.7
Kerala	17.7	34.0	24.4	26.5	31.5
Madhya Pradesh	2032.5	2411.0	2522.5	2959.5	4083
Maharashtra	1334.5	1496.5	5770.2	8938.5	10997
Manipur	5.0	5.0	3.5	7.5	8.4
Meghalaya	1.6	2.3	1.2	0.5	0.1
Mizoram	0.0	0.0	0.0	0.0	0.0
Odisha	1477.7	1604.7	1800.9	2152.5	1766.4
Puducherry	1.8	0.5	0.3	0.4	0.0
Punjab	0.0	0.0	0.0	0.0	0.0
Rajasthan	6058.9	6570.3	5866.0	6409.8	6228.2
Sikkim	0.0	0.0	0.0	0.0	0.0
Tamil Nadu	269.3	213.4	44.8	137.7	15.9
Telengana	0.0	0.0	335.6	898.7	711.3
Tripura	0.9	0.0	0.0	0.9	1.9
Uttar Pradesh	814.5	1122.5	738.6	1688.7	3591.1
Uttarakhand	59.6	67.1	57.9	85.9	175.2
West Bengal	563.0	580.5	1081.8	1024.7	3056.7
Grand Total	**20719.9**	**20962.2**	**23754.1**	**30681.5**	**40492.2**

Annexure 3:

State	No of Farmers Insured (in 000s)				
	Rabi 2012-13	**Rabi 2013-14**	**Rabi 2014-15**	**Rabi 2015-16**	**Rabi 2016-17**
Andaman & Nicobar	0	0	0	0	0
Andhra Pradesh	406	326	194	182	153
Assam	26	24	25	14	9
Bihar	1637	2153	1579	1434	1228
Chhattisgarh	105	98	94	79	150
Goa	0	0	0	0	0
Gujarat	33	27	2	2	133
Haryana	113	141	0	0	597
Himachal Pradesh	53	66	114	111	244
Jammu & Kashmir	8	0	0	0	0
Jharkhand	51	78	65	54	41
Karnataka	128	55	38	326	1391
Kerala	40	28	25	35	46
Madhya Pradesh	2028	2442	2637	1966	2815
Maharashtra	1074	310	1249	3577	1014
Manipur	1	0	0	0	0
Meghalaya	2	1	1	1	0
Mizoram	0	0	0	0	0
Odisha	98	53	118	106	54
Puducherry	2	2	1	1	9
Punjab	0	0	0	0	0
Rajasthan	3979	4285	4021	4554	3056
Sikkim	0	0	0	0	1
Tamil Nadu	1005	594	663	937	1430
Telangana	0	0	710	376	265
Tripura	0	0	0	1	11
Uttar Pradesh	1123	762	1034	1917	2984
Uttarakhand	22	12	21	66	86
West Bengal	747	813	753	981	1078
Grand Total	**12682**	**12273**	**13344**	**16720**	**16803**

Annexure 4:

State	Area Insured (000 ha)				
	Kharif 2012	**Kharif 2013**	**Kharif 2014**	**Kharif 2015**	**Kharif 2016**
Andaman & Nicobar	1.1	1.5	1.1	0.8	0
Andhra Pradesh	3694.4	2975.5	353.8	1982.9	1387.4
Assam	27.6	23.9	14.0	19.9	36.7
Bihar	1720.7	1975.1	2207.0	1504.1	1312.2
Chhattisgarh	2238.0	1209.9	1688.8	2160.6	2200.2
Goa	0.3	0.5	0.2	0.1	0.5
Gujarat	2472.9	2136.5	1384.3	1027.4	2566.7
Haryana	170.5	224.2	0.0	0.0	1188
Himachal Pradesh	15.9	9.1	13.0	13.6	39.5
Jammu & Kashmir	5.5	5.8	0.8	0.0	0
Jharkhand	433.7	362.8	187.2	373.6	352.7
Karnataka	1098.6	828.9	1387.8	1236.7	1400.2
Kerala	17.4	20.7	20.9	24.6	21.4
Madhya Pradesh	4706.8	5274.8	5504.5	6519.0	6434
Maharashtra	1053.7	1343.8	3954.3	5692.8	6579.3
Manipur	7.5	9.8	6.5	16.8	9.1
Meghalaya	1.3	2.1	0.7	0.3	0.02
Odisha	1304.5	1374.5	1566.8	1945.4	1257.9
Puducherry	2.2	0.5	0.3	0.3	0
Punjab	0.0	0.0	0.0	0.0	0
Rajasthan	8411.5	8082.2	7744.0	7299.9	7490.3
Tamil Nadu	300.1	231.1	48.7	142.8	30.6
Telangana	0.0	0.0	364.6	1062.8	594.7
Tripura	0.9	0.0	0.0	0.7	0.8
Uttar Pradesh	1056.7	1263.5	1032.7	1980.5	3158.9
Uttarakhand	32.4	39.4	34.6	59.3	101.1
West Bengal	283.4	282.8	667.2	445.8	1502.2
Grand Total	**29057.8**	**27678.6**	**28183.7**	**33510.6**	**37828.2**

Annexure 5:

State	Area Insured (000 ha)				
	Rabi 2012-13	**Rabi 2013-14**	**Rabi 2014-15**	**Rabi 2015-16**	**Rabi 2016-17**
Andaman & Nicobar	0.0	0.2	0.1	0.6	0.3
Andhra Pradesh	592.9	460.2	284.8	300.5	165.2
Assam	15.8	14.8	16.2	8.5	4.3
Bihar	1685.7	2005.5	1526.2	1297.1	1153
Chhattisgarh	194.6	169.2	205.9	181.9	232.1
Gujarat	71.2	61.7	4.4	4.1	274.7
Haryana	166.6	260.3	0.1	0.0	869.7
Himachal Pradesh	604.9	15.9	1624.3	1636.5	89.8
Jammu & Kashmir	10.3	0.0	0.0	0.0	0.0
Jharkhand	44.1	79.3	62.7	43.3	23
Karnataka	192.0	86.1	51.6	502.3	3148.9
Kerala	33.9	27.4	27.6	39.8	31.7
Madhya Pradesh	4373.9	5051.2	5298.2	3862.3	5137.2
Maharashtra	961.4	261.1	908.2	2608.5	715.8
Manipur	2.0	0.0	0.0	0.0	0.0
Meghalaya	1.0	0.8	0.7	0.7	0.01
Mizoram	0.1	0.0	0.0	0.0	0.0
Odisha	104.7	44.7	118.4	102.7	63.5
Puducherry	2.1	1.9	1.4	1.7	8
Punjab	0.0	0.0	0.0	0.0	
Rajasthan	4125.5	4530.1	4268.2	4565.3	2702.8
Sikkim	0.0	0.0	0.0	0.1	0.2
Tamil Nadu	1130.2	708.5	820.0	1087.8	1306.4
Telengana	0.0	0.0	999.2	489.6	270.7
Tripura	0.1	0.0	0.4	0.3	5.8
Uttar Pradesh	1259.3	936.2	1022.5	1884.9	2496.8
Uttarakhand	102.6	8.6	16.7	425.6	31.2
West Bengal	323.4	340.2	329.5	427.5	532.4
Grand Total	**15998.2**	**15065.5**	**17587.0**	**20371.3**	**19285.2**

Annexure 6: Bid submission and actuarial premium rates in Kharif 2016

State/UT	Scheme	Date of Bid Submission	Actuarial Premium Rates (%)
Andhra Pradesh	PMFBY	18.04.2016	8.8
	WBCIS	17.05.2016	8.6
Assam	WBCIS	18.05.2016	3.4
Bihar	PMFBY	05.07.2016	17.9
Chhattisgarh	PMFBY	06.04.2016	4.1
Goa	PMFBY	10.06.2016	1.3
Gujarat	PMFBY	06.05.2016 11.07.2016	20.5
Haryana	PMFBY	08.06.2016	3.6
Himachal Pradesh	PMFBY	20.04.2016	1.2
	WBCIS	20.04.2016	7.7
Jharkhand	PMFBY	04.04.2016	14.0
Karnataka	PMFBY	23.05.2016	14.2
	WBCIS	23.05.2016	11.6
Kerala	WBCIS	08.06.2016	7.8
Madhya Pradesh	PMFBY	29.04.2016	14.6
	WBCIS	28.05.2016	11.1
Maharashtra	PMFBY	08.06.2016 11.07.2016	18.7
	WBCIS	08.06.2016	33.5
Manipur	PMFBY	01.07.2016	9.7
Odisha	PMFBY	10.06.2016	7.7
Rajasthan	PMFBY	08.07.2016	19.8
	WBCIS	13.07.2016	43
Tamil Nadu	PMFBY	05.08.2016	4.7
Telangana	PMFBY	23.04.2016	5.5
	WBCIS	23.04.2016	11.5
Tripura	PMFBY	16.05.2016	1.4
Uttar Pradesh	PMFBY	18.05.2016	4.7
	WBCIS	18.05.2016	18.0
Uttarakhand	PMFBY	21.03.2016	1.1
	WBCIS	26.04.2016	11.0
West Bengal	PMFBY	04.04.2016	3.3
	WBCIS	02.05.2016	8.0
All India	PMFBY		12.5
	WBCIS		12.5

Annexure 7: Term sheet of Onion (Kharif 2016) in Rajasthan

State: Rajsthan District: ALWAR

Crop: ONION (KHARIF) Reference Weather Station: AS PER NOTIFICATION Unit: HECTARE

RAINFALL VOLUME	PERIOD		1 AUG. TO 31 AUG.	1 SEP.. TO 30 SEPT.	
	INDEX				
	STRIKE		300	100	
	EXIT		100	30	
	RATE		387.00	737.14	
	MAXIMUM PAYOUT (RS.)		77400	51600	
	TOTAL PAYOUT	129000			
	Maximum of 3 consecutive day's cumulative rainfall in respective phases				
EXCESS RAINFALL (MULTIPLE PAYOUT)	PERIOD		1 AUG. TO 31 AUG.	1 SEP.. TO 30 SEPT.	
	INDEX				
	STRIKE		100	60	
	EXIT		200	120	
	RATE		774.00	860.00	
	MAXIMUM PAYOUT (RS.)		77400	51600	
	TOTAL PAYOUT	129000			
	SUM INSURED (Rs.)	10000			
	FARMER'S PREMIUM (Rs.)				

Total Maximum Payout shall not exceed Rs 1,29,000.

Annexure 8:

				Yield Data				State Subsidy Status (in Lakhs)					
State	**Season**	**Scheme**	**Company**	**Yield data submission date as per notification**	**Date of Yield data Received**	**Data Received /pending**	**If pending mention crops**	**Total**	**Pending**	**Paid**	**Estimated Claims (in Lakhs)**	**Claims Payable (in Lakhs)**	**Claims Paid (in Lakhs)**
Bihar	Kharif 16	PMFBY	AIC	28.02.2017	16.02.2017 & 28.02.2017	Received		12800	6400	6400	6323	6323	0
Bihar	Kharif 16	PMFBY	BAJAJ	30.11.2017	20.01.2017	Received		15530	15530	0	16420	16419	0
Bihar	Kharif 16	PMFBY	CHOLA	31.01.2017	15.02.2017	Received		3872	1936	1936	3164	3164	0
Bihar	Kharif 16	PMFBY	SBI	22.05.2017		Received		10385	5192	5193	360	360	0
Bihar	Kharif 16	PMFBY	Tata	15.01.2016	15.02.2017 & 28.02.2017	Received		7006	3502	3503	2671	2671	
Bihar	Kharif 16 TOTAL							49593	24796	28938	28937	28727	0
Bihar	Rabi 16-17	PMFBY	NIC	Wheat ,Gram, Mustard, Maize, Potato- 31.05.2017 Sugarcane- 30.06.2018	Wheat , Gram , Mustard , Potato - 01.06.2017 Sugarcane & Maize- 30.06.2017	soft copies of CCE data is pending , CCE data from GOI portal is not accessible		5762	0	5762	3779	3779	0
Bihar	Rabi 16-17	PMFBY	UNITED INDIA		30.05.2017 & 30.06.2017			5494	0	5494	7475	0	0
Bihar	Rabi 16-17 TOTAL							11257	0	11257	7475	0	0
Haryana	Kharif 16	PMFBY	BAJAJ	30.11.2016	11.03.2017	Received		4447	0	4447	11485	11485	10924
Haryana	Kharif 16	PMFBY	ICICI	Post harvesting, One month	23.01.2017			1397	1333	65	5411	5411	5253
Haryana	Kharif 16	PMFBY	Reliance		16.01.2017	Received		2475	0	2475	6436	6536	6536
Haryana	Kharif 16 TOTAL							8320	65	6821	23482	23280	23172
Haryana	Rabi 16-17	PMFBY	BAJAJ	15.04.2017	30.06.2017	Received		1263	0	1263	1870	1870	1528
Haryana	Rabi 16-17	PMFBY	ICICI	Within one month from final harvest		Received		95	0	95	1622	1622	614

Haryana	Rabi 16-17	PMFBY	Reliance		24.07.2017	Received		524	0	524	2245	2245	0
Haryana	Rabi 16-17 TOTAL							1882	0	1882	5778	5778	3749
Assam	Kharif 16	RWBCIS	HDFC					77	1	76	319	319	319
Assam	Kharif 16	RWBCIS	Reliance			Received		63	0	63	183	183	183
Assam	Kharif 16 TOTAL							184	44	140	502	502	502
Assam	Rabi 16-17	PMFBY	NIC	Within one month from final harvest	Not yet received	Pending for all crops	Wheat, Summer Paddy, Rape and Mustard, Potato, Sugarcane	43	43	0			
Assam	Rabi 16-17 TOTAL							43	43	0	0	0	0
Assam								184	44	139	502	502	502
Chhattisgarh	Kharif 16	PMFBY	IFFCO	Within one month from final harvest	29.01.2017	Received	N/A	5288	74	5215	5951	5951	5834
Chhattisgarh	Kharif 16	PMFBY	Reliance		23.01.2017	Received		1926	1	1926	6820	6820	6820
Chhattisgarh	Kharif 16 TOTAL							7215	74	7140	12652	12652	12652
Chhattisgarh	Rabi 16-17	PMFBY	AIC	1. Lathyrus:- 20.04.2017 2. Wheat Un-irrigated 3. Linseed, 4. Rapeseed & Mustard and 5. Potato :- 30.04.2017, 6. Bengal Gram (Chana):- 15.05.2017, 7. Wheat Irrigated:- 31.05.2017, 7. Wheat Irrigated:- 31.05.2017	09.05.2017; 31.05.2017; 08.06.2017; 30.06.2017 & 05.07.2017	Incomplete. Pending data	Lathyrus, Wheat Un-irrigated, Linseed, Rapeseed & Mustard and Potato, Bengal Gram (Chana), Wheat Irrigated	948	0	948	664	536	0
Chhattisgarh	Rabi 16-17	PMFBY	BAJAJ	15.04.2017	25.05.2017	Partially Received	All Crops	1190	0	1190	1583	1583	1199
Chhattisgarh	Rabi 16-17	RWBCIS	BAJAJ	20.04.2017	30.06.2017			201	0	201	82	82	
Chhattisgarh	Rabi 16-17							2342	0	2342	2682	2682	2640

	TOTAL												
Chhattisgarh TOTAL								9555	74	9480	15454	15494	13295
Kerala	Kharif 16	RWBCIS	AIC	Risk period was upto 30.11.2016 for Autumn Paddy crop, upto 28.02.17 for Ginger &Turmeric, upto 31.03.17 for Banana, upto 30.04.17 for Black Pepper and 31.05.17 for remaining five crops viz. Arecanut, Cardamom,Pineapple, Nutmeg & Sugarcane		Pending for Five crops out of 10 crops notified	Arecanut, Cardamom ,Pineapple, Nutmeg & Sugarcane	273	1	272	1795	1715	1702
Kerala	Kharif 16 TOTAL							273	1	272	1719	1715	1589
Kerala	Rabi 16-17	PMFBY	AIC	31.07.2017(Winter Paddy), 15.09.2017(Summer-Paddy), 31.12.2017(Banana, Winter Tapioca), 30.04.2018(Plantain& Summer-Tapioca)	Yield data for Winter Paddy was received from DES on 27.04.2017.However RO has sought certain clarifications on the data received vide our letter dated 8.5.17 which is still awaited	Pending Clarification for Winter Paddy data received on 31.05.2017 and the claim for Winter paddy under process.Yield data as such Pending for remaining 5 out of 6 crops notified as the COD is not yet over	Banana & Winter Tapioca for Rabi-I season and Summer Paddy,Plantain and Summer Tapioca for Rabi-II season	112	0	112	343	343	0
Kerala	Rabi 16-17	RWBCIS	UNITED INDIA		NA			913	0	913	1380	0	0
Kerala	Rabi 16-17 TOTAL							1024	0	1024	343	343	0
Kerala								1297	1024	272	3519	2058	1702

Annexure 9:

Total Cost to the Government (including both State and Central) at various premium rates with 75 percent subsidy (Centre and state share being 50:50)

Sum Insured	Actuarial Premium @ 12.0% (Rs. Crore)	Actuarial Premium @10.0% (Rs.crore)	Actuarial Premium @ 8.0% (Rs.crore)
Rs.50,000/ha	45,000	37,500	30,000
Rs.40,000/ha	36,000	30,000	24,000

Cost to the Central Government at various premium rates with 75 percent subsidy

Sum Insured	Actuarial Premium @ 12.0% (Rs. Crore)	Actuarial Premium @10.0% (Rs.crore)	Actuarial Premium @ 8.0% (Rs.crore)
Rs.50,000/ha	22,500	18,750	15,000
Rs.40,000/ha	18,000	15,000	12,000

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