

## MAKING AGRICULTURAL INSURANCE IN INDIA FARMER-FRIENDLY AND CLIMATE RESILIENT

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### Abstract

Agricultural risks are exacerbated by a variety of factors ranging from climate variability and change, frequent natural disasters, uncertainties in yields and prices, weak rural infrastructure, imperfect markets and lack of financial services including limited span and design of risk mitigation instruments such as credit and insurance. Indian agriculture has little more than half (53%) of its area still rainfed and this makes it highly sensitive to vagaries of climate causing unstable output. Besides adverse climatic factors, there are man-made disasters such as fire, sale of spurious seeds, adulteration of pesticides and fertilizers etc., and all these severely affect farmers through loss in production and farm income, and are beyond the control of farmers. Hence, crop insurance<sup>1</sup> is considered to be the promising tool to insulate the farmers from risks faced by them and to sustain them in the agri-business. This paper critically evaluates the performance of recent crop insurance scheme viz., Pradhan Mantri Fasal Bhima Yojana (PMFBY) and its comparative performance with earlier agricultural insurance schemes implemented in the country. It is heartening that, the comparative performance of PMFBY with earlier schemes revealed that, the Government has definitely taken a leap forward in covering more number of farmers and bringing more area under crop insurance with the execution of this new scheme and on this front, it deserves the appreciation in fulfilling the objective for bringing more number of farmers under insurance cover. The use of mobile based technology, reduced number of Crop Cutting Experiments (CCEs) and smart CCEs, digitization of land record and linking them to farmers' account for faster assessment/settlement of claims are some of the steps that contributed for effective implementation of this new crop insurance scheme.

However, inadequate claim payments, errors in loss/yield assessment, delayed claim payment, no direct linkage between insurance companies and farmers are the major shortcomings of this scheme. This calls for revamping the crop insurance program in India from time to time in tune with the dynamic changes in climatic factors on one hand and to provide a safety-net for farmers to mitigate losses arising from climatic shocks on the other. The future research avenues include: insuring the revenue of the farmer (Price x Yield) as in USA and more and more tenant farmers should be brought under insurance by doling out discounts for group coverage of farmers like in Philippines where 20 per cent discount in premium is given for a group of 5-10 farmers, 30 per cent for a group of 10-20 and 40 per cent for a group of >20 farmers.

### Key words

NAIS, MNAIS, WBCIS, PMFBY

### I . Introduction

Agricultural risks are exacerbated by a variety of factors ranging from climate variability and change, frequent natural disasters, uncertainties in yields and prices, weak rural infrastructure, imperfect markets and lack of financial services including limited span and design of risk mitigation instruments such as credit and insurance. These factors not only endanger the farmer's livelihood and incomes, but also undermine the viability of the agriculture sector and its potential to become a part of the solution to the problem of endemic poverty of the farmers and the agricultural labour. Among these risks, scientific evidence has established that, climate change is accelerating the frequency and intensity of extreme weather events like droughts, floods, unseasonal rainfall and extreme temperatures. In developing countries like India, agriculture plays an essential role in the process of economic development and is the main source of national income

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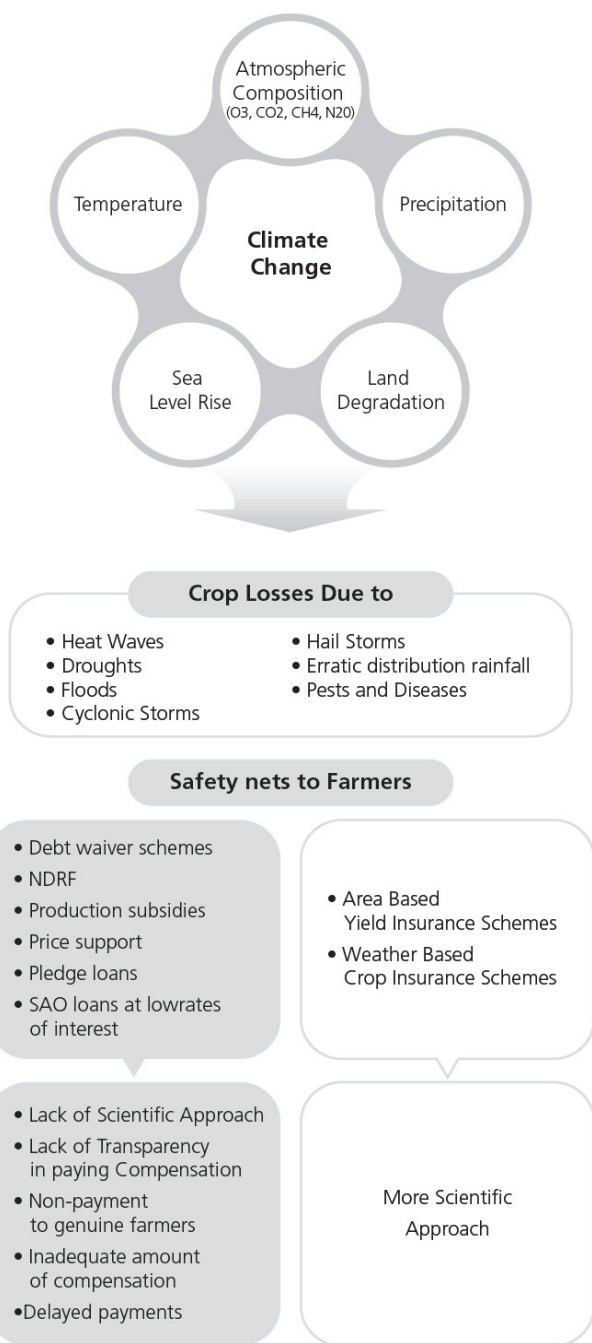
and occupation since Independence. In the early 1950s, agricultural and allied sectors constituted about 57 per cent of the country's total GDP and 70 per cent of the workers were engaged in these sectors. Even though there was acceleration in agricultural and allied sectors growth during subsequent decades (1960 to 2010), yet there has also been a sharp fall in the shares of these sectors in overall GDP due to slower growth compared to the overall economy. While the share of agriculture and allied sectors in GDP declined to 44 per cent during early 1970s, to 29 per cent in early 1990s, and finally to about 14 per cent during the more recent period, TE 2012-13 (calculated at 2004-05 constant prices). If the shares of forestry and fishing are removed, agriculture (including livestock) accounted for about 12 per cent of the national GDP. However, the share of workers engaged in these sectors has declined very slowly from 70 per cent in the early 1950s to 55 per cent during the more recent period. Thus, even after 70 year of Independence, the largest percentage of workforce is engaged in agriculture. It is the more recent period i.e., beyond 1991, which coincides with the liberalization of the economy and launching of the economic reforms, that has witnessed a significant shift in workers out of agriculture and allied sectors. In spite of this, it is also an important feature of agriculture that, growth of other sectors and overall economy depends on the performance of agriculture to a considerable extent. Because of these reasons, agriculture continues to be the dominant sector in Indian economy.

#### **i. Need for Insurance Schemes in Indian Agriculture:**

Indian agriculture has little more than half (53%) of its area still rainfed. This makes it highly sensitive to vagaries of climate causing unstable output. The occurrence of droughts, floods, heat waves, cyclones, hailstorms, erratic distribution of rainfall etc., cause severe crop damages and huge losses to farmers. On an average, 12 m. ha of cropped area is affected annually by these natural calamities. It has been established that, 50 per cent of the variations in crop yield is due to variations in rainfall. Besides adverse climatic factors, there are man-made disasters such as fire, sale of spurious seeds, adulteration of pesticides and fertilizers etc., and all these severely affect farmers through loss in production and farm income, and are beyond the control of farmers.

Developed countries have a variety of Government-supported, agriculture-related insurance services. But, in India after Independence, farmers generally relied on informal arrangements like diversifying crops, favouring

modern techniques over traditional practices, and entering into share-cropping arrangements. Such arrangements, however, are not totally gainful in mitigating the risks as efficiently as formal arrangements. It is a fact that, every year, in one part of India or the other, agriculture is affected by natural calamities. Crop yield instability is the normal condition and agriculture continues still to be which the farmer's fortunes are exposed, is practically the same as before. In fact, good years and bad years, wet weather and drought or floods and frost, low yields and bumper crops are to be expected in mixed succession. The total loss due to natural calamities (like flood, drought and plant diseases) is estimated as high as Rs. 1,000 crores every year. The man behind the plough has to be assured that he will be compensated for such loss in crops. Otherwise, he cannot be drawn into the campaign to increase productivity of land under his plough. So, as a security mechanism against the investments made by the farmers in the agri-business, the Government of India introduced first crop insurance scheme in 1972 and this scheme is fine-tuned from time to time keeping in view of the safety and livelihood security of the farmers. Further, in the context of changing climatic conditions (Figure 1), going for crop insurance was made compulsory for the loanee farmers and optional for non-loanee farmers to realize various benefits (in the event of crop failure) such as, provision of economic support, stabilize their farm income, induce them to invest in agriculture, protect their investments in crop production, reduce their indebtedness, improve risk bearing ability, decrease the need for relief measures etc. Further, it facilitates adoption of improved technologies resulting in higher agricultural production. However, even today, the penetration of insurance in India is less than 20 per cent of total farming households, which is a major concern for the Government. However, still 'crop insurance' is considered to be the promising tool to insulate the farmers from risks faced by them and to sustain them in the agri-business. The basic principle underlying crop insurance technique is that, the funds accumulated through small contributions made by many farmers is provided as indemnity to few farmers, who suffered yield losses. In other words, the losses incurred in bad years are compensated from resources accumulated in good years (Dandekar, 1976).



**Figure 1:** Scientific Approach of Crop Insurance Schemes in the context of Climate Change

Considering the susceptibility of Indian agriculture to various production risks, it is essential to protect the farmers from natural calamities and ensure their credit eligibility for the next season. For this purpose, the Government of India introduced many crop insurance schemes throughout the country (Figure 2). This paper critically evaluates the performance of recent crop insurance scheme viz., PMFBY and its performance is compared with earlier agricultural insurance schemes implemented in the country and this research study is focused on the following objectives:

- To analyze the extent of risk in production of major agricultural crops at Aggregate level (All-India and Andhra Pradesh) and dis-aggregate level (Kurnool district of Andhra Pradesh);
- To critically evaluate the performance of recent crop insurance scheme viz., PMFBY and compare its performance with earlier agricultural insurance schemes
- To explore the issues and constraints of crop insurance in India and
- To suggest measures for formulating a farmer-friendly, climate resilient, financially viable and administratively implementable crop insurance scheme in India

1972-78	• First Individual Approach Scheme, 1972-78, 1972-78
1979-84	• Pilot Crop Insurance Scheme (PCIS), 1979-84
1985-99	• Comprehensive Crop Insurance Scheme (CCIS), 1985-99
Rabi, 1997-98	• Experimental Crop Insurance Scheme (ECIS), Rabi, 1997-98, 1997-98
1999-00 to 2015-16	• National Agricultural Insurance Scheme (NAIS), 1999-00 to 2015-16
2003	• Farm Income Insurance Scheme (FIIS), 2003
2007	• Weather Based Crop Insurance Scheme (WBCIS), 2007
2010-11	• Modified National Agricultural Insurance Scheme (MNAIS), 2010-11 to 2015-16
2013-14	• National Crop Insurance Programme (NCIP), 2013-14
2016	• Pradhan Mantri Fasal Bima Yojana (PMFBY), 2016

**Figure 2:** Progress of Insurance Schemes in Indian Agriculture

## II. Methodology

The study estimates risk associated with crop production both at aggregate (All-India and Andhra Pradesh) and disaggregate (Kurnool district of Andhra Pradesh) levels. Risk associated with agriculture and various crops was estimated by using Instability Index as an indicator of risk as below:

Instability index = Standard deviation of natural logarithm  $(Y_{t+1}/Y_t)$ .

where,  $Y_t$  is the crop area / production / productivity in the current year and,  $Y_{t+1}$  represent the same in the

next year. This index is unit free and very robust and it measures deviations from the underlying trend (log linear in this case). When there are no deviations from trend, the ratio  $Y_{t+1}/Y_t$  is constant, and thus standard deviation in it is zero. As the series fluctuates more, the ratio of  $Y_{t+1}/Y_t$  also fluctuates more, and standard deviation increases (Ray,1983 ; Rao et al., 1988).

To analyze the economic performance of PMFBY and compare its performance with earlier agricultural insurance schemes in India, the secondary data pertaining to area insured and number of farmers insured are collected from the Agriculture Insurance Company of India Limited (AIC); Agricultural Statistics at a Glance, Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics and [www.indiastat.com](http://www.indiastat.com). In order to understand ground level working of PMFBY and other major crop insurance schemes, Kurnool district was purposively selected, as it is one of the major drought prone districts in Scarce Rainfall Zone of Andhra Pradesh (Figure 3). Despite being the largest of the four districts of Rayalaseema region, Kurnool district remains the backward region of Andhra Pradesh. It is identified as being in the Scarce Rainfall Zone of Andhra Pradesh, with an annual rainfall of 500 to 750 mm (average rainfall in the state is approximately 670 mm). In this district, the primary data are collected from sample farmers through a field survey in two mandals viz., Kurnool and Adoni (100 farmers from each mandal) pertaining to issues/constraints in implementing crop insurance schemes and for suggesting a crop insurance scheme to be farmer-friendly, climate resilient and economically viable in the future. Informal discussions are also held with the officials of cooperative and commercial banks to cross check the information supplied by the sample farmers.



**Figure 3:** Map showing Andhra Pradesh state (inset) and Kurnool district (in red)

### III. Results and Discussion:

#### i. Extent of risk in production of major agricultural crops at Aggregate level (All-India and Andhra Pradesh):

**a. All-India level:** Variability in agricultural production is influenced by variability in both area and productivity of crops. The variability in area of a crop is influenced mainly by natural factors like drought, floods etc., and its expected prices. Variability in productivity of a crop is influenced by factors like supply of quality inputs and balanced nutrition to the crop, outbreak of pests and diseases, climatic change etc. The risk in area, production and productivity of major crops at All-India level was computed through instability index (Table 1). Among the selected crops, rice area showed 3.56 per cent fluctuation around trend during pre-WTO regime (1975-76 to 1994-95), which increased to 3.66 per cent during post-WTO regime (beyond 1995). However, areas under wheat and maize showed 3.29 and 3.81 per cent fluctuations respectively around trend during pre-WTO regime and this declined to 3.14 and 3.01 per cents respectively during post-WTO regime. The instability in the productivity of these three crops declined during post-WTO regime compared to pre-WTO regime and this led to decline in production risk over time. However, both area and production risks of total cereals showed increasing trend during these reference periods and this is due to increasing area risk under cultivation of coarse cereals.

**Table 1:** Crop-wise risk in Area, Production and Productivity, All-India (%)

Crops	Area		Production		Productivity	
	1975-76 to 1994-95	1995-96 to 2014-15	1975-76 to 1994-95	1995-96 to 2014-15	1975-76 to 1994-95	1995-96 to 2014-15
Rice	3.56	3.66	13.39	9.92	10.66	7.1
Wheat	3.29	3.14	7.49	6.38	5.99	4.48
Maize	3.81	3.01	16.75	12.27	14.44	10.93
Total cereals	3.92	5.2	14.47	15.1	11.79	11.75
Total pulses	5.13	7	14.03	13.69	10.47	9.35
Food grains	3.17	3.43	9.31	8.8	6.99	6.11
Groundnut	12.82	9	21.65	41.25	18.25	35.08
Total oilseeds	4.83	5.98	15.25	19.86	12.54	17.02
Cotton	6.1	7.22	15.96	18.21	12.65	15.73

Raw Data Source: Agricultural Statistics at a Glance, 2016; Government of India

In the case of total pulses, area under cultivation showed declining trend after 1959-60 (except in 2010-11) and instability index of area increased during post-WTO regime compared to pre-WTO regime. Though the instability in area is increased, the instability in productivity is decreased and hence in production. However, in view of the nutritive value of pulses in human diet, the instability in area should be decreased and the Government through National Food Security Mission (NFSM) has given top priority to increase production of pulses in the country through area expansion and productivity enhancement. Regarding major oilseed crop, groundnut, area followed declining trend after 1993-94, but fluctuations in area reduced and remained quite low. This declining trend in area under groundnut (also for total oilseeds since 1993-94 (except for few years viz., 2004-05, 2005-06, 2008-09, 2010-11 and 2013-14)), made national production and productivity of groundnut (oilseeds in general) more volatile. Productivity risk between the two periods increased from 18 per cent to 35 per cent and production or output risk increased from 22 per cent to 41 per cent for groundnut. In case of total oilseeds, productivity risk between the two periods increased from 13 per cent to 17 per cent and production or output risk increased from 15 per cent to 20 per cent for groundnut. This made the production of oilseed crops in general and groundnut in particular, a most risky enterprise at national level. Among all the crops, cotton is affected most by vagaries of nature, as indicated the higher instability indices for area, production and productivity during post-WTO regime compared to pre-WTO regime. One reason for this seems to be large-scale pink boll worm damage (ranging between 50 and 90 per cent) to cotton crop in different growing regions of India. So, this crop faced difficult phase due to attack of cotton boll worm during 1997-98 to 2002-03. This affected productivity of cotton more adversely and consequently the area under cotton showed fluctuations, especially during post-WTO regime. The net impact on production also showed an increase in risk. These results showed that, over a period of time, risk in area declined in all the cereal crops except rice (and total cereals), where it showed substantial increase. In case of total pulses, food grains, total oilseeds and cotton, area risk increased except for groundnut. Productivity risk decreased in all the crops except groundnut, total oilseeds and cotton. Year to year fluctuations in area after 1993-94 remained more or less same in wheat, but they showed increase in all other crops. It can also be inferred from the findings that, with the innovations in production technologies and increase in irrigation potential in the country, though area

instability increased in crops like rice, total pulses and food grains, instability in productivity of these crops declined during the reference periods. However, in case of commercial crops like groundnut and cotton, productivity risk is found to be much higher than risk in area. Being the commercial crops, this has severe implications for farm income, as the farmers make only small variation in resources allocated to production, but output or return to their investment follows much larger fluctuations. In view of this, it is essential to stabilize the productivity of crops through producing HYVs, pest and diseases, promote conservation through rain water harvesting, evolving crop varieties that are less susceptible to the vagaries of weather etc. (Sharma et al., 2006).

**b. Andhra Pradesh level:** Regarding Andhra Pradesh, the instability index (Table 2) computed for area, production and productivity of major crops revealed interesting facts that, area risk showed increasing trend after 2004-05 for all crops (except sunflower) with highest percentage in case of jowar (nearly by 6.5 times) followed by red gram (3.2 times), maize (2.6 times) green gram and groundnut (almost doubled). However, the risk for productivity showed decreasing trend after 2004-05 for all the crops (except jowar, maize, groundnut and sunflower) and by major percentage in jowar (2.8 times) followed by sunflower (2.3 times). Risk in productivity was lower than in area after 2004-05 for all crops except for groundnut and sunflower. Risk in production of all crops was increased after 2004-05 except for rice, bajra and chillies and it showed highest increase with reference to jowar (2.6 times) and this was mainly due to drastic increase in both area (6 times) and productivity risks (2.8 times). This is followed by maize, sunflower, cotton, groundnut and green gram (1.2 to 1.8 times). It is disheartening that, due to slow irrigation progress (gross area irrigated) in the State (34.14 lakh ha in 1990-91 to 35.82 lakh ha 2016-17), rainfall variability continues to exert strong adverse influences on both area and production of majority of crops.

**Table 2:** Crop-wise risk in Area, Production and Productivity, Andhra Pradesh (%)

Crops	Area		Production		Productivity	
	1996-97 to 2004-05	2005-06 to 2013-14	1996-97 to 2004-05	2005-06 to 2013-14	1996-97 to 2004-05	2005-06 to 2013-14
Rice	15.81	16.02	25.25	17.94	9.98	4.99
Jowar	8.66	55.69	18.16	47.52	12.09	33.50

Crops	Area		Production		Productivity	
	1996-97 to 2004-05	2005-06 to 2013-14	1996-97 to 2004-05	2005-06 to 2013-14	1996-97 to 2004-05	2005-06 to 2013-14
Bajra	33.71	45.11	62.61	59.12	29.48	23.47
Maize	16.78	43.52	22.07	39.69	16.85	26.27
Green gram	21.58	44.56	57.38	71.21	46.86	39.64
Red gram	15.63	50.24	53.92	60.95	37.82	27.55
Black gram	20.60	31.12	33.01	36.28	24.39	24.59
Groundnut	13.24	24.87	58.44	75.29	47.30	54.39
Sunflower	20.21*	15.87	18.63*	30.30	10.14*	23.19
Chillies	20.87	24.53	38.69	27.28	28.82	14.97
Cotton	23.91	41.68	33.57	50.85	27.15	22.05

Note: \* - Period refers to 2000-01 to 2004-05

Raw Data Source: Statistical Abstract of Andhra Pradesh - Various Issues

#### ii. Extent of risk in production of major agricultural crops at Disaggregate level - Kurnool district:

Risk revealed by instability index of area, production and productivity of selected crops in Kurnool district of Andhra Pradesh is presented in Table 3. Risk for area showed increasing trend after 2007-08 for all crops except cereals (rice and maize), bengal gram and cotton. It increased by major percentage in case of groundnut (nearly by four times) and jowar, bajra and sunflower (almost doubled) during recent period, 2008-09 to 2014-15 compared to 2001-02 to 2007-08. The risk for productivity showed increasing trend after 2007-08 for all the crops except rice, jowar, bengal gram and green gram and by major percentage in crops like bajra and cotton (almost increased by 2.8 times) followed by black gram and chillies (almost doubled). Risk in productivity was lower than in area after 2007-08 for all crops except for bajra, maize, bengal gram, groundnut and chillies after 2007-08.

**Table 3:** Crop-wise risk in Area, Production and Productivity, Kurnool district (%)

Crops	Area		Production		Productivity	
	2001-02 to 2007-08	2008-09 to 2014-15	2001-02 to 2007-08	2008-09 to 2014-15	2001-02 to 2007-08	2008-09 to 2014-15
Rice	35.92	21.66	45.40	15.40	18.48	11.12
Jowar	13.38	26.58	27.10	31.25	21.62	15.26

Crops	Area		Production		Productivity	
	2001-02 to 2007-08	2008-09 to 2014-15	2001-02 to 2007-08	2008-09 to 2014-15	2001-02 to 2007-08	2008-09 to 2014-15
Bajra	23.66	45.52	50.93	115.43	28.06	78.94
Maize	67.57	29.68	63.42	56.77	21.89	33.25
Bengal gram	25.76	15.05	37.89	36.24	32.10	29.02
Green gram	71.88	85.29	138.99	68.44	98.52	34.02
Red gram	14.94	36.56	41.76	57.98	35.30	39.87
Black gram	75.18	86.04	77.40	91.14	17.82	30.79
Groundnut	9.34	35.01	44.56	75.93	38.46	43.14
Sunflower	19.81	33.28	23.40	38.34	18.19	23.06
Chillies	23.99	34.40	30.35	45.21	17.43	33.67
Cotton	59.65	10.09	54.69	64.02	25.85	73.51

Raw Data Source: Hand Book of Statistics, Chief Planning Office, Kurnool district - Various Issues.

Risk in production of all crops was increased after 2007-08 except for rice, maize, bengal gram and green gram and it showed highest increase with reference to bajra (almost doubled) and this mainly due to drastic increase in both area and productivity risks (2.8 times). This is followed by groundnut, sunflower, chillies and cotton (1.2 to 1.5 times). It is interesting that, the increase in risks in area and productivity of these commercial crops except cotton contributed to higher risks in production. However, in case of cotton, it was found that, the development of resistance in cotton bollworm, *Helicoverpa armigera*, against insecticides like endosulfan, methomyl, monocrotophos, quinalphos, chlorpyrifos, fenvalerate and cypermethrin has provided an early warning of resistance to Bt cotton. This led to the drastic increase in productivity risk of cotton during 2008-09 to 2014-15 (3 times compared to the preceding period) and this contributed to the increase in production risk in the recent period. The source of increase in risk in area, production and productivity of majority of crops in Kurnool district during the selected reference period, 2001-02 to 2014-15 is frequent (severe) droughts. One third of Kurnool district is under the threat of severe drought. Of the three divisions - Kurnool, Adoni and Nandyal - the drought is most severe in Adoni division. Nine out of 14 years, droughts were reported in Kurnool and neighboring districts, which are major groundnut growing areas. In one year (2009-10) excessive rains caused the failure of crop in Kurnool district. Further, decline in area under irrigation (2.89 lakh ha

in 2010-11 to 2.86 lakh ha in 2014-15) also contributed to the increase in productivity instability. Groundnut producers suffered not only due to increase in year to year fluctuations but they also harvested lower yields during drought years.

### iii. Performance of PMFBY and its comparison with earlier schemes:

Government of India introduced improvised versions of crop insurance schemes from time to time duly expanding the earlier schemes both horizontally and vertically. The suggestions of policy makers with reference to expansion of schemes to new crops like annual commercial and horticultural crops, more coverage of risks like prevented/failed sowing, post harvest losses, localized perils etc., weather aberrations, inclusion of private insurance companies to work along with AIC for speedy settlement of claims, development of requisite infrastructure to estimate the yields of crops and weather parameters, use of technology like smart phones to capture and upload data of crop cutting to reduce the delays in claim payment to farmers and remote sensing to reduce the number of CCEs (in PMFBY to be discussed in the ensuing pages) etc., are incorporated from time to time. In spite of fine tuning the crop insurance schemes over the past 44 years, the coverage of farming community is abysmally low to the tune of only 20 per cent. In this context, the blame cannot be thrown solely on the administrative issues of the execution of these schemes, but the fact of failure of these schemes to attract farming community is the major concern. That is, though the schemes are formulated with thorough planning at the apex level, they failed to attract significant number of farmers in availing the opportunity. In this context, the Government of India introduced a new crop insurance scheme, 'PMFBY' in line with 'One Nation-One Scheme' theme and it replaces existing two schemes viz. NAIS and MNAIS by removing their inherent drawbacks (shortcomings) and incorporating the best features of all previous schemes.

#### Objectives of PMFBY:

- To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests & diseases.
  - To stabilize the income of farmers to ensure their continuance in farming.
  - To encourage farmers to adopt innovative and modern agricultural practices.
  - To ensure flow of credit to the agriculture sector.
- Features of PMFBY:** Some of the innovative features of the scheme are:
- Lower premiums compared to existing insurance schemes.
  - Insuring income of the farmer and not crop per se.
  - In PMFBY, there will not be a cap on the premium and reduction of the sum insured.
  - Promises to provide **prompt and easy settlement of claims through the use of technology** like GPS, smart phones, remote sensing and drones to access actual crop damage.
  - 25 per cent of the likely claim will be settled directly on farmers account.
  - There will be one insurance company for the entire state.
  - **Implementing Agency:** Implemented by multiple insurance companies but under overall control of Ministry of Agriculture & Farmers Welfare.
  - **Management of the scheme:** The existing State Level Co-ordination Committee on Crop Insurance (SLCCCI), Sub-Committee to SLCCCI, District Level Monitoring Committee (DLMC) already overseeing the implementation & monitoring of the ongoing crop insurance schemes like NAIS, WBCIS and MNAIS shall be responsible for proper management of the Scheme.
  - **Unit of Insurance:** The Scheme shall be implemented on an 'Area Approach basis'. For major crops, the Unit of Insurance shall ordinarily be Village/Village Panchayat level and for minor crops may be at a higher level depending upon the requirement.
  - **Farmers to be covered:** All farmers growing notified crops in a notified area during the season who have insurable interest in the crop are eligible.
  - **Risks to be covered:** Natural Fire and Lightning, Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado etc., Flood, Inundation and Landslide, Drought, Dry spells, Pests/ Diseases, Post-harvest losses etc.
- a. Number of Farmers Insured:** With the execution of PMFBY from Kharif, 2016, the total number of farmers insured (under both yield based and weather based insurance schemes) has increased by 20.42 per cent ie., from 475 lakhs to 572 lakhs between 2015-16 and 2016-17 (Kharif + Rabi seasons, Table 6). Regarding the number of farmers insured under area based yield insurance programme/scheme after execution of PMFBY, the number increased from 392 lakhs to 551 lakhs ie., by 40.56 per cent. This showed that, with the execution of PMFBY in Kharif, 2016-17, the number of farmers insured increased

substantially than NAIS and MNAIS put together in 2015-16. Thus, replacing both NAIS and MNAIS by PMFBY has brought more number of farmers under the insurance cover.

It is further interesting to note that, the number of farmers insured under PMFBY is more during Kharif season (389 lakhs) compared to Rabi season (162 lakhs) of 2016-17 (Tables 4 and 5). This new crop insurance scheme has provided coverage to 389 lakh farmers in Kharif 2016 as compared to 254 lakh farmers in Kharif 2015, an increase of 53 per cent (Table 4). Similarly, during Rabi 2016-17, the number of farmers insured under PMFBY is 162 lakhs, an increase of 17.4 per cent from Rabi 2015-16 (Table 5). However, the number of farmers insured in RWBCIS during Rabi, 2016-17 is quite low (only six lakhs) and this led to slow increase in the total number of farmers insured during 2016-17 compared to 2015-16 i.e., from 27.69 to 20.42 (Table 6).

**Table 4:** Farmers Insured (lakhs) under NAIS, WBCIS, MNAIS and PMFBY

**(Kharif 2013 to Kharif 2016)**

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Kharif 2012	107	21	128		81	209	
Kharif 2013	97	24	121	-5.5	89	210	0.5
Kharif 2014	97	59	156	28.9	82	238	13.4
Kharif 2015	206	48	254	62.8	54	308	29.4
Kharif 2016 (PMFBY)	389		389	53.1	15	404	31.2

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

**Table 5:** Farmers Insured (lakhs) 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	61	10	71		56	127	
Rabi 2013-14	40	30	70	-1.4	53	123	-3.1
Rabi 2014-15	71	32	103	28.9	31	134	8.9
Rabi 2015-16	101	37	138	34.0	29	167	24.6
Rabi 2016-17 (PMFBY)	162		162	17.4	6	168	0.6

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

**Table 6:** Farmers Insured (lakhs) under NAIS, WBCIS, MNAIS and PMFBY

**(Kharif + Rabi, 2012-13 to 2016-17)**

Year	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
2012-13	168	31	199		137	336	
2013-14	137	54	191	-4.02	142	333	-0.89
2014-15	168	91	259	35.60	113	372	11.71
2015-16	307	85	392	51.35	83	475	27.69
2016-17 (PMFBY)	551		551	40.56	21	572	20.42

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

**b. Area Insured:** The total area insured in Kharif + Rabi seasons, 2016-17 (under both yield based and weather based insurance schemes), has registered a marginal increase of only 6.52 per cent over 2015-16 i.e., from 537 lakh ha to 572 lakh ha between 2015-16 and 2016-17 (Table 9). Regarding the area insured under area based yield insurance programme/scheme after execution of PMFBY, it increased from 425 lakh ha to 555 lakh ha i.e., by 31 per cent. Thus, with the execution of PMFBY in 2016-17, the area insured increased substantially than NAIS and MNAIS put together in 2015-16. As in the case of number of farmers insured, the area insured under PMFBY is more during Kharif season (366 lakh ha) compared to Rabi season (189 lakh ha) of 2016-17 (Tables 7 and 8).

This new crop insurance scheme has provided area coverage of 366 lakh ha in Kharif 2016 as compared to 272 lakh ha in Kharif 2015, an increase of 35 per cent (Table 7). Similarly, during Rabi 2016-17, the area insured under PMFBY is 189 lakh ha and registered an increase of 24 per cent from Rabi 2015-16 (Table 5). The area insured under PMFBY during Kharif, 2016 is found significant in Rajasthan, Madhya Pradesh, Maharashtra, Uttar Pradesh, Gujarat and Chhattisgarh in Kharif 2016. Similarly, in Rabi 2016-17, Madhya Pradesh, Rajasthan, Uttar Pradesh, Karnataka, Tamil Nadu and Bihar states registered significant area insured under PMFBY.



**Table 7:** Area Insured (lakh ha.) under NAIS, WBCIS, MNAIS and PMFBY**(Kharif 2012 to Kharif 2016)**

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
Kharif 2012	157	22	179		111	290	
Kharif 2013	143	23	166	-7.3	112	278	-4.1
Kharif 2014	116	70	186	12.0	96	282	1.4
Kharif 2015	217	55	272	46.2	63	335	18.8
Kharif 2016		366	366	34.6	13	379	13.1

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

**Table 8:** Area Insured (lakh 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	87	7	94		59	153	
Rabi 2013-14	65	33	98	4.3	53	151	-1.3
Rabi 2014-15	93	36	129	31.6	48	177	17.2
Rabi 2015-16	118	35	153	18.6	49	202	14.1
Rabi 2016-17		189	189	23.5	4	193	-4.5

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

**Table 9:** Area Insured (lakh ha) under NAIS, WBCIS, MNAIS and PMFBY**(Kharif + Rabi, 2012-13 to 2016-17)**

Season	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
2012-13	244	29	273		170	443	
2013-14	208	56	264	-3.30	165	429	-3.16
2014-15	209	106	315	19.32	144	459	6.99
2015-16	335	90	425	34.92	112	537	16.99
2016-17 (PMFBY)		555	555	30.59	17	572	6.52

Raw Data Source: 'Agricultural Statistics at a Glance', Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India - Various Issues

From the Tables 6 and 9, it can be inferred that, India has definitely taken a leap forward in covering more number

of farmers and bringing more area under crop insurance with the execution of PMFBY.

On this front, the Government of India deserves the appreciation in fulfilling the objective for bringing more number of farmers under insurance cover. The number of non-loanee farmers availing crop insurance under PMFBY have exceeded the number of loanee farmers in Maharashtra, Karnataka, Tamil Nadu and Jharkhand during 2016-17 and 2017-18. Further, the number of non-loanee farmers availing crop insurance under PMFBY has increased in 2017-18 over 2016-17 in Chhattisgarh, Jharkhand, Orissa and Uttar Pradesh states. Since its launch in Kharif, 2016, this scheme spruced up coverage from 26 per cent of gross cropped area in 2015-16 to 30 per cent in 2016-17. The Government's goal is to bring 50 per cent of the crop area under insurance by 2018-19. However, though India has a long history with crop insurance, the level of farmers insured under various Government programs has remained disappointingly low. PMFBY scheme is meant to improve upon some of the previous failed programs and aims to increase the area under crop insurance to as much as 50 percent of the gross cropped area in the country. Yet despite subsidies in excess of 75 percent, the level of insurance take-up has been slower than anticipated (Ghosh et al, 2019). The informal discussions held with the Bank Officials in Kurnool district of Andhra Pradesh has revealed that, the use of mobile based technology, reduced number of CCEs and smart CCEs, digitization of land record and linking them to farmers' account for faster assessment/settlement of claims are some of the steps that contributed for effective implementation of this new crop insurance scheme. However, these modern technologies are yet to be fully accomplished at village/gram panchayat level, so as to further increase in the penetration of PMFBY among the farming community in the near future. Further, the data pertaining to SI, gross premiums, claims approved and paid, number of farmers reported etc., are available under PMFBY only for the years 2016-17 and 2017-18. Hence, it is too early to analyze the economic performance of this scheme and to draw its comparative picture with earlier schemes. This analysis can be done meticulously, only when the scheme completes at least five years of implementation period. But, an issue of concern is that, one of the important mandates of claim settlement within a period of one month could not be accomplished for the first two seasons of the PMFBY scheme, as the claim settlement has not been done for the Kharif, 2016 crop up to March, 2017. As per the latest available data – on August 15th 2017 – shows that, insurance firms have

received claims, including those not settled, of Rs 15,100 crore from farmers, but only approved Rs 9,446 crore till date. However, still there is a long way to go regarding the improvement in performance of PMFBY scheme regarding technology utilization for yield estimation and crop loss assessment, payment of claims to the farmers in time and to develop the necessary infrastructure and train the field staffs.

**iv. Issues in Crop Insurance Schemes:**

The major issues in crop insurance as perceived by majority of the farmers are inadequate claim payments, errors in loss/yield assessment and delayed claim payment (Table 10). The informal discussions revealed that, for Kharif 2016, the claim payment to farmers was inordinately delayed—till June 2017 and claims are partly paid only for 62 per cent of sample farmers. The banks/insurance agencies are also not very responsive to the farmers after receiving the claims from the farmers. Insurance companies have failed to set-up infrastructure for proper implementation of PMFBY. There is still no direct linkage between insurance companies and farmers. However, the farmers had good response about the PMFBY mainly due to low rates of premium and claim settlement procedures are greatly simplified compared to NAIS and MNAIS. But, the real challenge is keep up those promises especially, processing of claims and their prompt payment to farmers to win their confidence. As mandated, the technology usage for the yield/loss assessment in PMFBY was done only at few places in Kurnool district. So, still there is a long way to go as far as PMFBY is concerned. However, considering the period of execution of PMFBY, it is too early draw ‘negatives’ about this scheme.

**Table 10:** Issues of crop insurance (PMFBY & RWBCIS) as perceived by the farmers.

S.No.	Problems	Percentage of farmers
1	Claim procedure is difficult to understand	60
2	Delayed payment of the claim amount	89
3	Loss estimation was not proper	91
4	Compensation amount was not enough to cover losses	95
5	Response of the Banks/Insurance agencies not proper	81

Raw Data Source: Survey among sample farmers of Kurnool district

Before planning the possible potentials for scaling up in agricultural insurance, the important pitfalls/issues are identified based on the informal discussions held with farmers and bankers in Kurnool district (Figure 4).



**Figure 4:** Issues and Constraints of Insurance Schemes in India

**v. Future Crop Insurance Policy for India:**

On the basis of the foregoing discussion in the preceding sections, the following suggestions are made to revamp the existing crop insurance schemes in India (Figure 30) to increase their operational efficiency and effectiveness as a risk management strategy in the context of increasing agricultural risk due to climate change:

- Crop Insurance Associations of Farmers (CIAF) may be formed at village/gram panchayat level so that, the farmers get a feel of voluntary participation in crop insurance schemes.
- Like a drive for financial literacy at the national level, a separate drive for insuranceliteracy among farmers especially, small and marginal farmers is essential to change the attitude among them towards insuring their crops.
- To promote the penetration of crop insurance schemes among the farming community, the basic responsibility lies with the Government or AIC. Instead of bringing loanee farmers alone under the insurance cover on compulsion basis, now the Government should be pro-active in compelling all the farmers to avail crop insurance through various measures like, linking insurance premium with marketing of farm produce in APMCs (deducting premium of crops for the ensuing season at the time of payment of sales proceeds to farmers in the markets), tying up insurance with the supply of inputs to farmers on subsidy basis (like seed, fertilizer, pesticides, irrigation, electricity), technical assistance to farmers by insurance companies from payment of premiums to settlement of claims, subsidizing premium rates to farmers when no claims are made

for the past five years, when the farmers prefer to go for organic farming etc.

- In designing insurance products, PPP should be promoted to install the infrastructure (say, automatic rain gauges, automatic weather stations etc) for getting requisite data on yield and weather parameters so that, the claim settlements can be made quickly.
- It is high time to promote climate-friendly farming in the country and crop insurance is an effective tool for its implementation. The crop insurance programme can aim at promoting risk mitigation and adaptation strategies against climate change by inducing proper proactive and reactive responses in insurance users. The risk mitigation responses include: incentivising use of climate-friendly technology, cropping pattern, promoting organic farming and less energy intensive agriculture. Proactive adaptation responses include: encouraging cultivation of drought resistant variety crops, IPM, INM, IWRM etc.
- The crop insurance schemes implemented so far in India suffered from a common and severe limitation about delayed settlement of claims to the beneficiaries. The IA along with the insurance companies should be in direct contact with Officials of Department of Agriculture from time to time after the beginning of crop season and collect the data on the relevant parameters. Even the State Agricultural Universities (SAUs) across the country should play a proactive role in collecting the farmers' responses through their meetings and inform the same to IA. Effective triangulation between IA, Line Department of Agriculture and SAUs will enable to ascertain the realistic information about the extent of crop losses due to changes in weather parameters, pests and diseases incidences, delayed sowings/plantings, post-harvest losses, localized calamities etc., and thus help the IA/insurance companies to design for prompt settlement of claims to the farmers.
- Besides use of technology in PMFBY, digitalizing land records and linking them with farmers' accounts will help speed up assessments of the damage to the crop and, in turn, the settlements of the claims. This also reduces moral hazard in crop insurance..
- Finally, crop insurance, a risk transfer measure, will be effective only in combination with risk reduction measures like physical measures (like bunding, silt application), biological measures (quality seeds), timely cultivation practices (sowing in the right season) and diversification measures (diversification to livestock/ other allied enterprises) and risk coping measures like timely credit availability.

#### IV. Conclusions

In the context of both short term and long term threats of climate change on Indian agriculture, it is essential to design the new crop insurance programs in the future, so as to achieve a balance between present risk mitigation techniques and future management of risks with innovative farm managerial practices that works best in the new climate context. The resulting benefits from the newly designed climate resilient crop insurance strategies must outweigh the costs and thereby, provide a cost-effective mechanism for improving adaptive capacity on already vulnerable agricultural lands.

It is hoped that, the above suggested new efforts will improve the base of crop insurance in India. But, increasing farmer's awareness towards crop insurance is the essential aspect to be considered on priority basis and for this, the new schemes to be formulated in the future are required to be simplified, made more flexible and easily understandable to the farmers. To conclude, crop insurance in India is still in an experimental and developmental phase. Despite impressive development of agricultural infrastructure and irrigation potential, a large part of Indian agriculture still remains exposed to climatic risks. This calls for revamping the crop insurance program in India from time to time on the lines suggested above in tune with the dynamic changes in climatic factors on one hand and to provide a safety-net for farmers to mitigate losses arising from climatic shocks on the other.

This study points to several avenues for future research. Instead of insuring the yield of crops, the revenue (Price x Yield) of the farmer must be insured like in USA. Use of drones, remote sensing technology, GPS, satellite imaging et cetera should be made compulsory (in the field) to assess the crop losses accurately along with timely settlement of claims (Adeeth & Lokesh, 2019).

Before announcing ambitious schemes proper process evaluation should be done to foresee the capacity building process like availability of technology and manpower required to implement and run the program smoothly. Further more and more farmers, tenant farmers should be brought under insurance by doling out discounts for group coverage of farmers like in Philippines where 20 per cent discount in premium is given for a group of 5-10 farmers, 30 per cent for a group of 10-20 and 40 per cent for a group of >20 farmers.

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