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An Unsuccessful Story of Crop Insurance in India: Evidence from Small and Marginal Farmers

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Abstract
Even after 75 years of independence, Indian agriculture still depends on the monsoons. The uncertainty of weather adversely impacts crop production. If severe drought or floods occur during the reproductive stages, the possibility of crop failure is inevitable and the money spent on cultivation undergoes a severe loss. This financial damage has often compelled farmers to even commit suicide. In this scenario, the 'Crop Insurance' can provide some relief to the farmers from impending loss. This study has tried to evaluate the impact of crop insurance on agricultural production using the Principal Component Regression model. The results of this research indicate that crop insurance has a positive and significant impact on the production of all crops except in the case of groundnut. However, even though the history of crop insurance in India can be traced back to 1972, repeated revision of the schemes and considerable support in the form of premium subsidies for the farmers have failed to produce the desired results. The benefits have reached less than 30 percent of the farmers as well as area under insurance covered not satisfactory. Whereas, the government aims to cover at least 50 percent of farmers with its PMFBY crop insurance scheme.

Key Words: *Crop Insurance, Indian Agriculture, Principle Component Analysis, Prime Minister Fasal Bima Yojona, National Agriculture Insurance Scheme*
JEL Classification: Q18, C 38

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I. Introduction:

Agriculture is the backbone of the Indian economy. As per 2018 data, around 50 percent of rural households depend on agriculture as their principal means of livelihood. Agriculture, along with its allied sectors like dairy, fishery, and forestry, is one of the largest contributors to the GDP. The share of agriculture and allied sectors is 15.87 percent of the Gross Value Added during 2018-19 at current prices (http://statisticstimes.com/economy/sectorwise-gdp-contribution-of-india.php). Nevertheless, agriculture has always displayed vulnerability to both weather and market conditions (Qamar Salman, 2017). This can result in inaccuracies about seasonal farm income assessments.

Post-independence, Indian agricultural production has been influenced in the long-run by the Green Revolution, land reforms, agricultural credit, agricultural extension and other factors. The Economic Survey of 2017-2018 pointed out that agriculture in India continues to remain susceptible to the fluctuation of monsoons. This is because India's percentage of net irrigated area to the total cropped area is even lower than 34.5 percent. Around 52 percent (73.2 million hectares area out of 141.4 million hectares net sown area) of agricultural land is still un-irrigated and dependent on monsoons (Financial Express Bureau, 2018). It must be borne in mind that rainfall is a variable beyond the farmers' control. The volume of rainfall varies over time. Sometimes it is more than what is needed and sometimes it falls short of the minimum requirement. Therefore, a fluctuation in the distribution of rainfall over the cropping season un-favorably affects rain-fed crops. If severe drought or flood occurs during the reproductive stages, the possibility of crop failure is inevitable. However, erratic rainfall isn't the sole factor affecting crop production in India. There are other factors at play here too. Indian agriculture not only suffers as a consequence of drought or flood but also runs the risk of frequent pest infestations. This is in addition to the effects a sudden occurrence of a storm or other climate induced hazards may have on crop output. In these cases, the flow of income from crops is irregular and inadequate. It must be noted that around 86 percent of Indian farmers are small and marginal. Most of the farmers are always in a debt trap. They lack the proper know-how and interest to protect their crops. As a result, they cannot protect themselves from this agricultural loss which has, in extreme cases, even compelled the farmers to commit suicide. 'Crop Insurance'

can give some relief to the farmers to minimize these impacts and protect them from the resulting increased indebtedness.

Indian farmers need crop insurance for another reason. According to the chairman of Dalwai committee regarding Doubling Farmers' Income, the average income of a farmer in India is estimated at Rs 98000 in 2015-16 and the Indian Government has targeted a doubling of farmers' income by 2022. Yet, it cannot be ignored that Indian farmers are not in a homogeneous position. Therefore, there is a lack of clarity over this increase in income: is it for all farmers or just for large farmers? Is this increase going to be brought about across all the states of India or just in some particular states? It is also not clear whether this is an increase in income (revenue) or in profit. The answers to these questions can be traced to other studies. But there is no dispute over the fact that the financial condition of the Indian farmer is far from satisfactory. It is imperative to increase the incomes of Indian farmers. Augmented incomes create effective demand that will boost economic growth. Farmers do attempt to increase their income by cultivating high-value crops. But, according to portfolio balance theory, more returns are associated with larger risks. The poor farmers of India do not dare to take more risks because of the already existing climate hazards and their associated economic losses. Against this pre-existing backdrop, Crop Insurance may provide the necessary courage to farmers to take that risk.

By definition, Crop Insurance is an important measuring instrument used by farmers for mitigating the financial losses due to various types of natural calamities or risks that damage and destruct the production. So, Crop insurance has become a necessity for agriculture and it can provide some relief to the farmers in the face of uncertainties.

In other words, it is a more efficient risk management tool than traditional strategies such as crop diversification, inter-cropping, mixed farming, integration of farms, etc. It encourages farmers to allocate resources so as to maximize returns since they are assured of financial compensation against any loss. It also provides a strong stimulus to farmers to take more risk by growing more of the lucrative crops and adopt state-of-the-art technologies. Crop insurance not only protects the farmers against natural disasters, shocks and adverse weather conditions, but also spurs efficient use of resources and consequently, a higher level of productivity. In the long run, farmers feel encouraged to invest in technological investments in addition to producing high yielding (high risk) crops and this eventually leads to higher production and productivity (Elia Riesling, 2017).

More specifically, Crop Insurance helps the farmers innumerous ways.

(i) Output Protection: Crop insurance protects the farmer from crop failure due to natural calamities

(ii) Income Stability: Crop insurance helps to manage the risk of productivity and prices and so protects the farmer from income loss.

(iii) Minimal Debts: Crop Insurance helps farmers pay off loans during crop failures.

(iv) Awareness: Insurance companies conduct awareness campaigns that help the farmers understand the effect of natural calamities and how they can protect their farms.

Lastly and most importantly, the major benefit of Crop Insurance is that farmers feel empowered and in due course, develop a peace of mind.

There is no doubt that when agriculture goes hand in hand with disasters and risks beyond the farmers' control, it is necessary to take precautionary measures to control the damage faced by farmers. Crop insurance clearly emerges as a reasonable precautionary measure. A far-reaching Crop Insurance plan helps to stabilize farmers' incomes and minimizes the negative impact of crop failure on farmers' life.

Our research has a twofold focus:

i. To evaluate how crop insurance has impacted agriculture in India.

ii. To unearth the factors responsible for these schemes not being equally acceptable to all farmers even after so many years of the introduction of crop insurance.

2. In April 2016, in order to take care of the loopholes of earlier crop insurance schemes, the Central Government introduced the Pradhan Mantri Fasal Bima Yojana (PMFBY) in the Indian agricultural context to achieve the objective of "one nation, one scheme". Primarily, this scheme has been implemented by the state-run Agriculture Insurance Company of India (AIC). Other government insurance companies include United India Insurance, New India Assurance and Oriental Insurance, and private general insurers such as HDFC ERGO, ICICI Lombard, Reliance GI, and Iffco-Tokio.

The Objectives of PMFBY:

- To provide insurance coverage and financial support to the farmers in the case of notified crop failures resulting from natural calamities, pests & diseases attack.
- To ensure continuance in farming by stabilizing the income of farmers.
- To boost adoption of innovative and modern agricultural practices.
- To guarantee credit-flow to the agriculture sector.

Features of the PMFBY:

The main features of this scheme, which differs from other previous schemes, are (**Centre for Science and Environment, 2017**):

- Coverage of Farmers: The scheme covers loanee farmers, non-loanee farmers, tenant farmers and sharecroppers. It is compulsory for loanee farmers whereas voluntary for non-loanee farmers.
- Coverage of Crops: It covers food crops (Cereals, Millets, and Pulses), oilseeds, annual commercial and annual horticultural crops for the Rabi and Kharif seasons.
- Coverage of Risks: It aims to prevent sowing/planting associated risks, losses to standing crop, post-harvest losses and losses linked to natural and localized calamities. The sum insured is equal to the cost of cultivation per hectare, multiplied by the area of the notified crop proposed by the farmer for insurance.
- Premium Rates: The PMFBY fixes a uniform premium rate of the sum insured, to be paid by farmers, 2 percent for all Kharif crops, of 1.5 percent for all Rabi crops, and 5 percent of for annual commercial (cocoa, coffee, cotton, tea, tobacco) and horticultural crops or actuarial rate, whichever is less, with no limit on government premium subsidy. The balance amount towards the premium will be paid by the central and state Government.
- Area-based Insurance Unit: The PMFBY operates on an area approach. Thus, all farmers in a particular area must pay the same premium and have the same claim payments. The area approach reduces the risk of moral hazards and adverse selection.
- Innovative Technology Use: It recommends the use of pioneering technology in agriculture. For example, using drones to reduce the use of crop cutting experiments (CCEs), which are traditionally used to estimate crop loss; and using mobile phones to reduce delays in claim settlements by uploading crop-cutting data on apps or online.
- Cluster Approach for Insurance Companies: It encourages L1 (lowest one) bidding amongst insurance companies before being allocated to a district to ensure fair competition. A functional insurance office will be established at the local level for grievance redressal, in addition to a crop insurance portal for all online administration processes.

The PMFBY has been implemented to ensure transparency, availability of real-time data and an accurate assessment of yield loss. However, to ensure success of PMFBY, both the Central and the States Government should have to be very careful about those factors that led to the ineffectiveness of the earlier schemes. It is an open secret that rampant fraudulent practices have taken place in the past in states like Karnataka, Gujarat, Andhra Pradesh, Maharashtra, etc. Networks of farmers, bank officials, and agriculture department officials were accused of running rackets generating false insurance claims and thus usurping money. The fraudulent practices are so high in some districts of certain states that people say that farmers claimcrop insurance on the basis of total area cultivated instead of crops specificarea. These corrupt practices are deep-rooted where Government officials show a higher loss while bank officials help farmers insure the same land repeatedly. The failure of earlier schemes was also a result of a widespread ignorance of the scheme amongst farmers, particularly the small and medium farmers (**ICFA, 2016**).

Thus, it emerges that one of the main reasons for the need to redesign crop insurance schemes repeatedly during the past decades is the existence of corruption and fraudulent practices. In February 2020, the PMFBY scheme has been structurally changed by the Union Cabinet to enable accurate yield estimation leading to faster claims settlement. Not only are these changes expected to help the farmers manage risk in agriculture production but it is also hoped that they will succeed to even out inequitable farm incomes. Moreover, it also aims to increase insurance coverage in the north-east part of the country. The anticipated changes may be listed as follows:

- The premium under PMFBY to be quoted by insurance companies may not exceed 40 percent during the upcoming Kharif season.
- Enrolment of loanee farmers to be voluntary under the Scheme.
- Introducing central subsidy for premium rates up to 30 percent for unirrigated crops and 25 percent for irrigated crops.
- The scheme to be flexible with the option to select any or many additional risk covers.
- To adopt the Smart Sampling Technique (SST) and the optimization of a number of Crop Cutting Experiments (CCEs).
- To extend the contract period for insurers from one year to three years.
- To implement Insurance Companies for non-provision of yield data beyond the cut-off date
- To increase Central Share in Premium Subsidy to 90 percent for the North Eastern States
- States to not allow implementation of the Scheme in subsequent seasons in case of considerable delay by States in the release of requisite Premium Subsidy to concerned Insurance Companies beyond a prescribed time limit.

If one traces the history of crop insurance in India, it goes back a long way. It was introduced for Indian agriculture in the year 1972. After that, policymakers have put forward various crop insurance policies at different points of time. However, despite repeated revision of these schemes and a huge support in the form of premium subsidies for the farmers, these crop insurance policies have failed to produce the desired results.
All these different crop insurance schemes, including PMFBY, have been subject to the scrutiny of many researchers who have tried to weigh the pros and cons of these schemes and offer recommendations.

II. Data Source:

The data on 7/8 crops for the period of 28 years (1990-91 to 2017-2108), have been used in this research. Secondary data relating to agricultural production, area of different crops in India have been collected from various issues of 'State Wise Area Production And Yield Statistics' (Directorate of Economics and Statistics, Govt. of India, 1990-91 to 2017-18). The data on irrigated area of different crops has been collected from 'Previous land use Statistics at a Glance' published by Directorate of Economics and Statistics, Govt. of India. Data related to the fertilizer consumption, use of certified crops, the number of agricultural labour and rainfall have been taken from different volume of 'Agricultural statistics at Glance'.

III. Methodology:

Econometric Model to Assess the Impact of Crop Insurance on Agricultural Production:

In order to assess the impact of crop insurance on agricultural production in India, a regression approach has been used. The following variables have been considered as the explanatory variables (independent variable):

i. land (000' Ha)
ii. labour (000' man-days)
iii. irrigation (000' Ha)
iv. fertilizer consumption (000' tonnes)
v. Certified seeds (000' tonnes)
vi. rainfall (mm.)
vii. crop insurance.

To capture the effect of crop insurance dummy variables have been used in the model. Production (000' tonnes) has been considered as dependent variable.

The principal component analysis (PCA) has been carried out in an attempt to group the variables to overcome the problem of multicolinearity. The principal components have been used as explanatory variables. In the next stage, the regression analysis has been carried out by regressing crop production. The significance of the variables can be identified by the value (>0.3) of the factor loadings in each principal component which are found to be significant in principal component regression.

Principal Component Regression Model (PCR):

The model using PCR method begins with PCA to overcome the problem of multicollinearity. The number of PC used in the PCR model have been selected based on the cumulative proportion of the total variability in the range from 89.254 percent to 98.527 percent. In this context the principal components are considered as regressor variables and the dependent variable is crop production. Three dummies have been used at 1990-91, 2007-08 and 2016-17 for National Agriculture Insurance Scheme (NAIS), Weather Based Crop Insurance Scheme (WBCIS)and Pradhan Mantri Fasal Bima Yojana (PMFBY) respectively. Dummy variables in the PCR model overcome the problem of error of heterogeneity. The PCR model with dummy variables gives a better model than the PCR model without dummy variables (**Sahriman Sitti et al, 2014**).
The Production has been specified as a function of the following Principal Components. The model for principal component regression is given by Equation (1):

$$Y = \beta_0 + \beta_1 PC_1 + \beta_2 PC_2 + \beta_3 PC_3 + \beta_4 D_1 + \beta_5 D_2 + \beta_6 D_3 + €_i \ldots\ldots (1)$$

Y = Crop Production, PC_i = Principal Components, D_i = dummy uses for different crop insurances(i =1, 2, 3)
β_i= all Co-efficient, Where:i = 0,1, 2, 3, 4, 5,6
D_1 = dummy uses for National Agriculture Insurance Scheme (NAIS)
D_2 =dummy uses for Weather Based Crop Insurance Scheme (WBCIS)
D_3 = dummy uses for Pradhan Mantri Fasal Bima Yojana (PMFBY)

IV. Results and Discussion:

The study considered the time period during 1990-91 to 2017-18 and covers 8 crops from 4 crop groups like cereals, pulses, oilseeds and commercial crop. The groups are presented in table1.Among cereals, the study focuses on rice and wheat. Gram considered as a type of Pulse. For oilseeds, the study analysed groundnut and rapeseed-mustard. For commercial crops, jute, cotton and sugarcane are considered.

Table 1: Group wise crops considered in the Study

Crop Group	Crops
Cereals	Paddy, Wheat
Pulses	Gram
Oilseeds	Groundnut, Rapeseed-Mustard
Commercial Crops	Jute, Cotton, Sugarcane

Source: Authors preparation

5A.Impact of crop insurance on different crop production:

In this study, six variables have been included in the principal component analysis (PCA) of which the first three Eigen values capture maximum variability and the corresponding three components are selected for further analysis. The Principal Component Regression (PCR) has been carried out for the period 1990-91 to 2017- 18. The rotated component matrix of independent variables with different factor loadings for all the crops under consideration has been provided in appendix table 1 which is calculated by using SPSS software. The factor loadings represent the weights assigned to each of the variables in the linear combination corresponding to each Eigen value. The values of factor loadings obtained for each principal component indicate that all the variables are significant. The results of the PCR model of different crops are presented in Table 2. To find the effects of crop insurance, the study discussed the results crop-wise which is explained in the next section.

Paddy: The principal component regression results explain that the coefficient of intercepts, the first principal component and the D_1 are positive and statistically significant. The first principal component has a positive influence on rice production based on the value of rotated first principal component factor loading. It can be said that the variables in the first rotated component factor are of irrigation, fertilizer consumption, and certified seeds, all of which have a positive effect on rice production. The other variables have no significant impact on rice production. As seen in table 2, the National Agriculture Insurance Scheme (NAIS) has significant effects on rice production but PMFBY has no effects on it.

The result indicates that around 84.7 percent of the variation in the dependent variable is mainly explained by the first principal component and second dummy. The calculated F value is 19.358. The results of this regression have been chosen at a 5 percent level of significance.

Wheat: Table 2 depicts that the intercepts, the first principal component, the third principal component, and the D_3 have a statistically significant effect on wheat production. The first principal component and D_3 have a positive influence on wheat production but the third principal component has a negative impact on it. The first component based on the value of rotated first principal component factor loading and third component is based on the value of rotated third principal component factor loading. It can be said that the variables in the first rotated component factor are of the land, irrigation, fertilizer consumption and certified seeds, all of which have a positive effect on rice production but variable in the third rotated component is rainfall has a negative impact on wheat production. The results also imply that PMFBY has positive and significant effects on wheat production.

The result indicates that around 95.2 percent of the variation in the dependent variable is explained by explanatory variables. The calculated F value is 69.887. The results of this regression have been chosen at a 5 percent level of significance.

Gram: The results of PCR depicts that the first and second principal component and D3 have a positive and significant impact on gram production. Whereas D1 has significantly negative impact. The first and second principal component are based on the value of rotated first and second principal component factor loading respectively. From rotated component matrix, in can be conclude that all of these variables have significantly positive impact except rainfall. The regression results also implies that PMYFB has significant and positive effect on pulses (gram) production.

The result indicates that around 86 percent of the variation in the dependent variable is explained by the independent variables. The calculated F value is 21.568. The results of this regression have been chosen at a 5 percent level of significance.

Groundnut: The principal component regression results explain that the intercepts and the third principal component has a positive influence on groundnut production based on the value of rotated third principal component factor loading. The variable in the third rotated component factor is rainfall which has a positive effect on groundnut production. From regression results, the study concludes that crop insurance has no significant effects on groundnut production.

The result indicates that around 51.1 percent of the variation in the dependent variable is explained by the independent variables. The calculated F value is 3.659. The results of this regression have been chosen at a 5 percent level of significance.

Rapeseed-Mustard: The coefficient of principal component regression of intercepts, the second principal component, and the D3 are positive and statistically significant. The second principal component has a positive influence on rapeseed-mustard production based on the value of rotated second principal component factor

loading. Land, labour, and irrigation are the variables in second rotated component factor which have a significantly positive effect on rapeseed-mustard production. The PMFBY has also a significant positive impact on it.

The result indicates that around 82.6 percent of the variation in the dependent variable is explained by the first principal component and second dummy. The calculated F value is 16.622. The results of this regression have been chosen at a 5 percent level of significance.

Table2: Estimates of Coefficients of the PCR Model with Crop Insurance Dummies

Crops	Constant	PC1	PC2	PC3	D1	D2	D3	R2	F statistics
Paddy	7.330*	0.063*	0.018	0.001	0.142*	0.055	0.043	0.847	19.358
t-values	306.629	4.804	0.835	0.140	5.674	1.246	0.985		(6,21)
Wheat	11.196*	0.146*	0.004	-0.021**	0.015	0.018	0.11*	0.952	69.887
t-values	322.123	5.487	0.358	-1.811	0.455	0.419	3.097		(6,21)
Gram	8.993	0.167*	0.098*	0.017	-0.380*	0.100	0.340*	0.860	21.568
t-values	109.999	3.283	2.705	0.584	-5.009	0.989	3.685		(6,21)
Groundnut	8.718*	0.199	0.052	0.104*	-0.022	0.390	0.198	0.511	3.659
t-values	68.921	1.799	0.828	3.117	-0.137	1.752	1.467		(6,21)
Rapeseeds- Mustard	8.630*	0.069	0.133*	0.023	0.111	0.054	0.158**	0.826	16.622
t-values	109.739	1.151	6.017	0.913	1.424	0.613	1.924		(6,21)
Cotton	7.839*	0.391*	-0.075**	0.048	0.184**	0.096	-0.021	0.932	48.184
t-values	96.027	4.936	-1.804	1.495	1.987	0.559	-0.174		(6,21)
Jute	7.33*	0.063*	0.018	0.001	0.142*	0.055	0.043	0.865	22.370
t-values	306.629	4.804	0.835	0.14	5.674	1.246	0.985		(6,21)
Sugarcane	12.673*	0.156*	0.104*	-0.007	-0.101*	-0.04	0.104*	0.910	35.268
t-values	288.028	7.657	3.64	-0.583	-2.265	-0.846	2.442		(6,21)

Source: Authors Calculation

Cotton: The principal component regression results presented in Table 2, imply that the intercepts, the first principal component, the second principal component and the D1 are statistically significant. The first principal component and first dummy (D1) have a positive influence and the second principal component has a negative effect on cotton production. The first component is based on the value of rotated first principal component factor loading and second component is based on the second principal component factor loading. The variables in the first rotated component factor are of land, labour, irrigation, and fertilizer consumption and all of these have a positive effect on cotton production, whereas rainfall is the second principal component factor loading and has a negative impact on it. It means excessive rainfall reduces cotton production. It also emerges that the National Agriculture Insurance Scheme (NAIS) has a significant effect on cotton production but PMFBY has no effect on it.

The result indicates that around 93.2 percent of the variation in the dependent variable is explained by the independent variables. The calculated F value is 48.184. The results of this regression have been chosen at a 5 percent level of significance.

Jute: The principal component regression results explain that the intercepts, the first principal component, and the D1 are positive and statistically significant. The first principal component has a positive influence on jute production based on the value of rotated first principal component factor loading. It can be said that the variables in the first rotated component factor are that of land and labour, both of which have a positive effect on jute production. The National Agriculture Insurance Scheme (NAIS) has also significantly positive effects on jute production.

This result indicates that around 86.5 percent of the variation in the dependent variable is mainly explained by the first principal component and first dummy. The calculated F value is 22.370. The results of this regression have been chosen at a 5 percent level of significance.

Sugarcane: The principal component regression results explain that the intercepts, the first principal component, the second principal component, the first dummy (D_1) and the third dummy (D_3) have statistically significant effects on sugarcane production. The first principal component and second principal component have a positive effect on sugarcane production based on the value of rotated first and second principal component factor loading. The variables in the first rotated component factor are of the land, labour and irrigation whereas the variable in a second rotated component is fertilizer consumption. All these variables have positive effect on sugarcane production. From regression results, it can be said that PMFBY has significantly positive impacts on sugarcane production while the National Agriculture Insurance Scheme (NAIS) has significant negative effects on sugarcane production.

The result indicates that around 91.0 percent of the variation in the dependent variable is explained by the variables used in PCR. The calculated F value is 35.268. The results of this regression have been chosen at a 5 percent level of significance.

In a nutshell, the study can conclude that crop insurance has a positive and significant impact on the production of all crops except groundnut.

5B.Why PMFBY is not a popular choice for the Indian farmer

Even crop insurance has positive and significant impact on agricultural production. It is to be noted that crop insurance has existed in some form or the other for more than four decades; but the benefits have reached less than 30 percent of the farmers (appendix) as well as area under insurance covered not satisfactory (table3) . The government aims to cover at least 50 percent of farmers with its PMFBY crop insurance scheme in the near future. (Mugunthan, K. 2016).

Table 3: Crop-wise area insured under all Scheme (Area in lakh hectare)

	2014-15			2015-16			2016-17			2017-18			2018-19		
Crops	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)
Paddy	442.38	96.50	21.81	439.93	114.93	26.12	437.74	134.24	30.67	441.56	121.05	27.41	436.62	114.07	26.13
Wheat	320.78	78.83	24.57	304.17	87.82	28.87	307.85	105.34	34.22	296.50	90.64	30.57	293.18	95.44	32.55
Pulse	217.07	65.35	30.11	249.11	71.19	28.58	294.45	87.39	29.68	298.13	75 .36	25.28	291.55	77.28	26.51
Oilseeds	284.24	101.41	35.68	260.86	132.51	50.80	261.77	111.88	42.74	245.07	110.82	45.22	247.94	115.94	46.76
Sugarcane	55.65	1.46	2.62	49.27	2.29	4.65	44.35	3.03	6.83	47.37	0.53	1.12	50.61	0.79	1.56
Cotton	126.60	15.32	12.10	122.92	14.49	11.79	108.26	35.86	33.12	125.86	26.02	20.67	126.14	25.74	20.41
Jute	8.19	0.69	8.42	7.28	0.04	0.55	7.06	0.73	10.34	6.85	0.32	4.67	6.65	0.34	5.11

Source:Department of agriculture cooperation and farmers welfare, AI: Area Insured

In the event of any natural disaster, the administration determines the extent of the damage. If the damage to the crop is above 33 percent in a particular area, the district magistrate declares that the zone is damaged and this is a crucial element that is factored in when it comes to providing compensation. Another condition of compensation will be met if the crop production falls short of the yield over the last seven years. In this way, the extent of the loss and the eligibility for compensation are determined. According to sources, the benefits of crop insurance do not reach all the farmers. Apart from this, many farmers do not show enthusiasm (See. Appendix table 2) because of the complexities involved in not only determining loss in crop insurance but also in the methods of availing compensation. Below are some case studies of farmers' perspectives on crop insurance in India.

Case I

In August 2017, one village in Palasi block of Bihar's Araria district was flooded by an overflowing Kosi river. Much of the paddy crop got washed away. Thankfully, around 250 farmers had got themselves covered under the Prime Minister's flagship crop insurance scheme for the first time. Premiums had been automatically deducted from their crop loan accounts held by a public sector bank without their consent. However, after the floods, it seemed like a blessing. A month after the water receded, the flood-hit farmers visited the bank as the insurer did not have a local office. They were informed matter-of-factly that their claims would be settled, but it may take more than a year to do so. "Such delays are normal", they were told. So they waited. By February 2019, their patience had worn off. They made a list of insured farmers and pressed for a settlement of the claim. The bank advised them to get in touch with the insurer, a private firm. The response of the insurer's customer service executive came as a rude shock. "You were supposed to intimate us within 48 hours of crop damage, which you didn't. Besides, according to our records, your crop did not suffer any significant loss." The farmers felt cheated. How could they inform the company when their homes were submerged in water during that critical time?(**Sayantan Bera, 2019**).

Case II

On February 2018, in the village of Uttar Rasulpur of Arambagh block in Hooghly of West Bengal, all the potatoes suffered damage in a hail storm. Despite having insurance, most of the farmers did not get any compensation. The bank had been deducted 4.8 percent to crop loans as a premium of insurance. However, the farmers do not know the extent of their coverage and had no idea about the volume of compensation due to them in these circumstances. The insurance company fixes the volume of losses as per their discretion despite the wastage of all the crops. Most of the time, the amount of compensation depends on the ability of the farmer to fight back with the bank officials. These banks are the faces of insurance companies.

Sujoy Mandal is one of the large farmers of this village. According to Mandal, "I cultivated potatoes on 8 bighas (1.07 ha) land. It has cost me around 1.75 lakh as 22000 per bigha. All the potatoes were damaged in the hail storm. Since, my loan amount is Rs 3.5 lakhs for potato cultivation, the bank has deducted Rs.17500 (4.8 percent of loan amounts) as insurance premium. But after losing all the potatoes, I was not compensated for anything at that time. After a prolonged struggle, I was compensated for only Rs 31000 in December 2019. I am unaware of how the amount of money is fixed; I am also unaware of the factors taken into consideration to

determine the amount of compensation. This year I told the bank that I will not insure: do not deduct a premium amount from my loan."

Case III

Govindapur village of Kotulpur block in the Bankura district of West Bengal, is geographically located adjacent to the district of Hooghly and East Burdwan. About 350 farmers of this village had crop insurance for Amman paddy. Each of them had an agricultural loan, so the insurance premium had been automatically deducted by the bank from their loan account. In November 2019, at the strike of the cyclonic storm Bulbul, crops suffered major damage in the said village of Bankura district along with other districts.80 percent of Amman paddy was transformed to wastage in the fields. The farmers approached the bank to claim the indemnity against their crop insurance of Amman paddy. The bank, as usual, told the farmers, that they had already informed the insurance company.

In the meantime, the West Bengal Government had announced the name of six districts whose farmers are eligible for aid at the rate of Rs 13343.70 per hectare (Rs. 54 / satak) because of sudden crop failure due to cyclonic storm Bulbul. The minimum amount of aid is Rs. 1000 per farmer and the maximum amount is Rs. 27000. But among the six districts, Bankura did not make it to the list. As a result, the insurance company said there was no damage to the crop and so they will not make any compensation. According to another farmer from the village, Sanatan Kole. "We met with the Agricultural Development Officer and informed him about our concerns regarding insurance claims and he told us that he would informthe higher authorities. From our past experiences, we can say that there will be no solution. We insure our crops year after year, but unfortunately, receive no indemnity for crop failures. The premium of insurance is fully wasted. We are starting to wonder whether we will continue to buy crop insurance."

Case IV

Another experience of farmers' harassment by insurance company comes to light in the case of these farmers of Uttar Pradesh have not been getting any payment of compensation for loss of Kharif 2019 crops, till the end of March, even though the crops had been insured with National Insurance, Oriental Insurance and Universal Sompo Insurance companies. The government is trying to make up for this loss of the farmers. The farmers who have insured their crops will soon be surveyed and will be given insurance for the loss. The Agriculture Minister of Uttar Pradesh government, Surya Pratap Shahi, has instructed the insurance companies to complete the survey work in 15 days and give the insurance amount of crop damage to the farmers. Expressing his displeasure over the insurance companies, hesaid that the toll-free number of the company is not functional. He instructed the insurance companies to ensure payment of compensation to farmers including interest by March 25, failing which they will be blacklisted and strict action would be taken against these companies (**Pronami Chetia, 2020**).

The above experiences match Ms. Kavitha Kuruganti's experience. Ms. Kuruganti, a member of farmer rights activist group Alliance for Sustainable and Holistic Agriculture (ASHA), asserts that insurance companies need to play a vital role in bringing about awareness among farmers on the scheme and its details. In an email response, she said, "Insurance companies today hide behind the banks. The banks are the front-end transaction faces for crop insurance. Farmers are not even aware that premium is being deducted for insurance from their crop loan amount disbursals."**(Mugunthan, K., 2016**)

The assessment of the damaged crops has also been a major bone of contention for farmers as well as insurers. The government has suggested using new-age technologies such as remote sensing, drones for faster and accurate measurement of damages to crops. However, not everyone is convinced about it. Farmer activist Kavitha Kuruganti says, "We think verification is certainly possible, but assessment still requires human interface since remote sensing has not evolved to an extent that it can capture village-wise details, for all crops notified as of now." Insurers though believe that with the wide reach of mobile phones and the government's digital India push, technology can be adopted to overcome those challenges. Krishnamoorthy Rao of Future General Insurance said, "We need to learn from some other countries where such technology is deployed."

Insurance companies though differ, as they are of the view that there are a lot of constraints when it comes to crop insurance. Sources among insurance companies who prefer not to be named said that lack of e-records on land is a big constraint for crop insurance. Only a few states in India possess e-records for land owned by farmers. They believe if crop insurance is made mandatory, it may improve the coverage significantly. Ashish Agarwal, Head, Agri-Business, Bajaj Allianz General Insurance said, "Only premium reduction would not help much in increasing coverage of farmers under the scheme. There is also an urgent need to launch campaigns to educate farmers and create awareness about the scheme among them"(**Mugunthan, K., 2016**).

V. Conclusion:

The agricultural sector is facing manifold problems such as crop failures, non-remunerative prices for crops and poor returns on yield. Agrarian distress is so severe, that it is pushing many farmers to despair; about 39 percent of the cases of farmer suicides in 2015 were attributed to bankruptcy and indebtedness. The 'Crop Insurance' can give some relief to the farmers from this problem. This study has tried to find the impact of crop insurance on agricultural production using Principal Component Regression model. The results explained that crop insurance has a positive and significant impact on the production of all crops except groundnut. Nevertheless,crop insurance in India has a long history. Even after repeated revisions of the schemes and a huge support in the form of premium subsidies for the farmers, crop insurance has failed to produce the desired results. The study aimsto suggest some recommendation to ensurethat the benefits of crop insurance reaches all farmers. The recommendation are as follows:

- For the scheme to be truly beneficial to farmers the government needs to engage them at all the levels.
- The central government should urge state governments to expedite the collection of digital land records.
- The faster adoption of modern technologies must be facilitated to assess the crop-damage as this will be crucial in implementing the scheme.
- Payment of premium to insurance companies by the government should be made without delay as this would also ensure that money is disbursed efficiently.
- The success of this program lies in increasing awareness amongst the farmers about these scheme.

References:

[1]. Ashok Gulati, Prerna Terway, Siraj Hussain. 2018. Crop Insurance in India: Key Issues and Way Forward, ICRIER, February 2018, Working Paper No. 352.https://think-asia.org/handle/11540/8052

[2]. Bera Sayantan. 2019. Crop Insurance Flaws Fuel Farm Distress, Livemint, Nov 2019. https://www.livemint.com/news/world/crop-insurance-flaws-fuel-farm-distress-11574185759756.html.

[3]. Centre for Science and Environment.2017. Pradhan Mantri Fasal Bima Yojana: An Assessment", Centre for Science and Environment, July 2017.https://www.cseindia.org/pradhan-mantri-fasal-bima-yojana-an-assessment-7778.

[4]. Elia Riesling. 2017. The Importance of Crop Insurance How it will Benefit Farmers, https://www.myfarminfo.com/blog/the-importance-of-crop-insurance-and-how-it-will-benefit-farmers/

[5]. FICCI. 2018. Accelerating Agricultural Insurance, Knowledge Paper Released at National Conference on Accelerating Agriculture Insurance.http://ficci.in/spdocument/22946/Agri-Insurance-book.pdf

[6]. Goudappa, S. B., Reddy, B. S. and Chandrashekhar, S.M. 2012. Farmers Perception and Awareness about Crop Insurance in Karnataka, Indian Research Journal of Extension Education, Special Issue (Volume II).

[7]. ICFA.2016. ICFA Report on Crop Insurance in India, https://icfa.org.in/assets/doc/reports/6106533-icfa-report-on-crop-insurance-india.docx.

[8]. Mugunthan, K.2016. Crop insurance scheme: Awareness, technology key for successful implementation. Economics Time Online, 6th April, 2016.https://economictimes.indiatimes.com/news/economy/agriculture/crop-insurance-scheme-awareness-technology-key-for-successful-implementation/articleshow/50981150.cms

[9]. Pronami Chetia. 2020.Crop Insurance Schemes in India: How Farmers Can Claim Crop Loss? Agricultural World, Krishijagaroan.Com, 22 March, 2020, https://krishijagran.com/

[10]. Qamar Salman. 2016. Diversification in Agriculture, Need of the Hour, Technology Times. Vol-4 (52). https://technologytimes.pk/post.php?id=4674

[11]. Rai, Ruchbah. 2019. Pradhan Mantri Fasal Bima Yojana: An Assessment of India's Crop Insurance Scheme, ORF Issue Brief No. 296, May 2019, Observer Research Foundation. https://www.orfonline.org/wp-content/uploads/2019/05/ORF_Issue_Brief_296_CropInsurance.pdf

[12]. Raju, S. S. 2008. Risk and Agricultural Insurance in India — A Disaggregate Analysis Principal Scientist National Centre for Agricultural Economics and Policy Research, New Delhi-110 012 https://www.iari.res.in/files/Divisions/Risk%20and%20Agricultural%20Insurance%20in%20India%20A%20Disaggregate%20Analysis.pdf

[13]. Sahriman Sitti, Djuraidah Anik, Wigena Aji Hamim. 2014. Application of principal component regression with dummy variable in statistical downscaling to forecast rainfall. Scientific Research. Open Journal of Statistics. 2014; 4: 678-686. http://dx.doi.org/10.4236/ojs.2014.49063.

[14]. The Government of India.2017. Press Information Bureau, Government of India, Ministry of Statistics & Programme Implementation, Second Advance Estimates of National Income, 2016-17 and Quarterly Estimates of Gross Domestic Product for The Third Quarter (Oct-Dec), 2016-17. 28-February-2017

[15]. Uvaneswaran, S.M., Mohanapriya, T. 2014. Farmers' Perception and Awarness about Crop Insurance in Tamil Nadu – A Descriptive Analysis, Intercontinental Journal of Marketing Research Review, Vol 2 (3), March 2014.

[16]. Young, C. E., and P. C. Westcott. 2000. "How Decoupled Is U.S. Agricultural Support for Major Crops?" American Journal of Agricultural Economics, 82:762–767.

Appendix table 1: Rotated Component Matrix of Different Crops

Variables	PC1	PC2	PC3
Paddy			
Ln certified seed	0.983	0.112	-0.043
Ln fertiliser	0.980	0.165	-0.025
Ln irrigation	0.832	0.495	0.164
Ln labour	0.192	0.934	0.000
Ln land	0.207	0.888	0.262

Ln rainfall	-0.006	0.148	0.984
Eigen Value	2.698	1.968	1.067
Variance (%)	44.959	32.806	17.786
Cumulative Variance	44.959	77.765	95.551
Wheat			
Ln irrigation	0.977	0.002	-0.057
Ln land	0.976	0.089	-0.110
Ln fertiliser	0.959	-0.160	-0.162
Ln certified seed	0.952	-0.191	-0.186
Ln labour	-0.065	0.987	0.137
Ln rainfall	-0.167	0.141	0.976
Eigen Value	3.766	1.065	1.046
Variance (%)	62.770	17.748	17.441
Cumulative Variance	62.770	80.518	97.959
Gram			
Ln fertiliser	0.849	0.411	-0.208
Ln certified seed	0.848	0.446	-0.198
Ln irrigation	0.778	0.577	-0.157
Ln labour	0.416	0.897	-0.043
Ln land	0.521	0.836	0.045
Ln rainfall	-0.178	-0.006	0.984
Eigen Value	2.521	2.206	1.079
Variance (%)	42.017	36.768	17.984
Cumulative Variance	42.017	78.785	96.768
Groundnut			
Ln certified seed	-0.964	0.185	0.040
Ln fertiliser	-0.955	-0.172	0.039
Ln land	0.904	0.375	0.111
Ln labour	0.903	0.382	0.118
Ln irrigation	0.161	0.977	0.054
Ln rainfall	0.026	0.055	0.997
Eigen Value	3.502	1.309	1.027
Variance (%)	58.366	21.814	17.113
Cumulative Variance	58.366	80.180	97.293
Rapeseed-mustard			
Ln fertiliser	0.973	-0.016	-0.146
Ln certified seed	0.940	0.165	-0.096
Ln land	0.139	0.884	0.330
Ln labour	-0.053	0.881	0.186
Ln irrigation	0.575	0.708	-0.093
Ln rainfall	-0.204	0.277	0.934
Eigen Value	2.224	2.165	1.056
Variance (%)	37.074	36.081	17.603
Cumulative Variance	37.074	73.155	90.758
Cotton			
Ln labour	0.983	0.073	-0.060
Ln land	0.981	0.053	-0.037
Ln irrigation	0.941	0.190	0.073
Ln fertiliser	0.930	0.129	-0.095
Ln certified seed	0.160	0.967	0.196
Ln rainfall	-0.055	0.186	0.980
Eigen Value	3.708	1.030	1.018
Variance (%)	61.805	17.174	16.971
Cumulative Variance	61.805	78.979	95.951
Jute			
Ln labour	0.960	0.011	0.077
Ln land	0.957	-0.119	-0.013
Ln certified seed	0.053	0.887	0.156
Ln fertiliser	-0.158	0.885	-0.084
Ln rainfall	0.040	0.049	0.993
Eigen Value	1.866	1.587	1.023
Variance (%)	37.329	31.737	20.461
Cumulative Variance	37.329	69.066	89.527
Sugarcane			
Ln labour	0.945	0.274	-0.095
Ln land	0.899	0.415	-0.020
Ln Irrigation	0.800	0.569	0.005
Ln fertiliser	0.496	0.861	-0.060

Ln rainfall	-0.044	-0.034	0.998
Eigen Value	2.589	1.314	1.01
Variance (%)	51.783	26.28	20.192
Cumulative Variance	51.783	78.062	98.254

Appendix table 2: Crop-wise area insured under all Scheme (Area in lakh hectare)

	2014-15			2015-16			2016-17			2017-18			2018-19		
Crops	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)	GCA	AI	AI (%)
Paddy	442.38	96.50	21.81	439.93	114.93	26.12	437.74	134.24	30.67	441.56	121.05	27.41	436.62	114.07	26.13
Wheat	320.78	78.83	24.57	304.17	87.82	28.87	307.85	105.34	34.22	296.50	90.64	30.57	293.18	95.44	32.55
Pulse	217.07	65.35	30.11	249.11	71.19	28.58	294.45	87.39	29.68	298.13	75 .36	25.28	291.55	77.28	26.51
Oilseeds	284.24	101.41	35.68	260.86	132.51	50.80	261.77	111.88	42.74	245.07	110.82	45.22	247.94	115.94	46.76
Sugarcane	55.65	1.46	2.62	49.27	2.29	4.65	44.35	3.03	6.83	47.37	0.53	1.12	50.61	0.79	1.56
Cotton	126.60	15.32	12.10	122.92	14.49	11.79	108.26	35.86	33.12	125.86	26.02	20.67	126.14	25.74	20.41
Jute	8.19	0.69	8.42	7.28	0.04	0.55	7.06	0.73	10.34	6.85	0.32	4.67	6.65	0.34	5.11

Source:Department of agriculture cooperation and farmers welfare, AI: Area Insured

Note:

$$\text{Indemnity} = \frac{\text{Shortfall in Yield}}{\text{Threshold yield}} X \text{ Sum Insured for the farmer}$$

[Shortfall = 'Threshold Yield - Actual Yield' for the Defined Area]

Threshold yield for a crop in a notified insurance unit is the average yield of past seven years (excluding a maximum of two calamity year/years as notified by State Government/ UT) multiplied by applicable indemnity level for that crop.

14.17 (b): Crop-wise area Insured under all Insurance Schemes

(Area in Lakh Hectare)

S.No.	Crops	2015-16			2016-17			2017-18			2018-19		
		Gross Cropped Area	Area Insured	% of Area Insured	Gross Cropped Area*	Area Insured	% of Area Insured	Gross Cropped Area*	Area Insured	% of Area Insured	Gross Cropped Area*	Area Insured	% of Area Insured
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	Paddy	433.81	114.93	26.49	433.81	134.44	30.99	433.81	126.67	29.20	433.81	114.07	26.29
2	Wheat	309.78	87.82	28.35	309.78	109.64	35.39	309.78	102.07	32.95	309.78	95.44	30.81
3	Nutri Cereals	241.11	59.61	24.72	241.11	55.90	23.18	241.11	44.89	18.62	241.11	47.86	19.85
4	Sugarcane	52.43	2.29	4.36	52.43	3.46	6.59	52.43	0.63	1.20	52.43	0.79	1.52
5	Cotton	120.93	14.49	11.98	120.93	35.73	29.55	120.93	25.50	21.09	120.93	25.74	21.28
6	Jute & Mesta	8.38	0.04	0.42	8.38	0.73	8.71	8.38	0.30	3.54	8.38	0.34	4.09
7	Oilseeds	283.00	132.51	46.82	283.00	126.81	44.81	283.00	119.03	42.06	283.00	115.94	40.97
8	Pulses	228.30	71.19	31.18	228.30	68.95	30.20	228.30	64.64	28.31	228.30	77.28	33.85
9	Vegetables	68.16	20.54	30.13	68.16	27.44	40.26	68.16	26.74	39.23	68.16	22.99	33.74
10	Fruits	46.58	3.97	8.52	46.58	3.94	8.46	46.58	3.08	6.61	46.58	14.78	31.73
11	Others	178.06	16.48	9.26	178.06	3.80	2.13	178.06	1.45	0.81	178.06	4.01	2.25
Area under all Crops		**1970.54**	**523.86**	**26.58**	**1970.54**	**570.84**	**28.97**	**1970.54**	**514.99**	**26.13**	**1970.54**	**519.25**	**26.35**

Source : Department of Agriculture, Cooperation & Farmers Welfare.

* Latest data for Gross Area Sown (also known as Gross Cropped Area) is available till 2015-16 and the same has been used for 2016-17 to 2018-19 for estimation purpose

14.17 (a): State-wise crop area insured under all Insurance Schemes

(Area in Lakh Hectare)

States/UTs	2015-16			2016-17			2017-18			2018-19		
	Gross Area Sown	Area Insured	% of Area Insured	Gross Area Sown*	Area Insured	% of Area Insured	Gross Area Sown*	Area Insured	% of Area Insured	Gross Area Sown*	Area Insured	% of Area Insured
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Andhra Pradesh	75.32	23.49	31.19	75.32	15.60	20.71	75.32	21.52	28.58	75.32	22.34	29.66
A & N Islands	0.48	0.01	2.87	0.48	0.00	0.53	0.48	0.00	0.52	0.48	0.01	1.16
Arunachal Pradesh	3.01	0.00	0.00	3.01	0.00	0.00	3.01	0.00	0.00	3.01	0.00	0.00
Assam	40.60	0.29	0.70	40.60	0.41	1.01	40.60	0.42	1.03	40.60	0.48	1.19
Bihar	75.72	28.06	37.06	75.72	24.84	32.81	75.72	21.26	28.07	75.72	0.00	0.00
Chandigarh	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Chhattisgarh	56.40	23.43	41.53	56.40	24.14	42.80	56.40	22.16	39.30	56.40	22.75	40.33
Dadar & Nagar Haveli	0.23	0.00	0.00	0.23	0.00	0.00	0.23	0.00	0.00	0.23	0.00	0.00
Daman & Diu	0.03	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00
Delhi	0.58	0.00	0.00	0.58	0.00	0.00	0.58	0.00	0.00	0.58	0.00	0.00
Goa	1.57	0.00	0.07	1.57	0.01	0.35	1.57	0.00	0.25	1.57	0.00	0.17
Gujarat	115.22	10.31	8.95	115.22	30.21	26.22	115.22	26.58	23.07	115.22	26.11	22.66
Haryana	65.10	0.00	0.00	65.10	20.85	32.02	65.10	19.34	29.70	65.10	20.55	31.56
Himachal Pradesh	9.33	0.54	5.80	9.33	1.29	13.88	9.33	1.11	11.87	9.33	0.89	9.59
Jammu & Kashmir	11.59	0.00	0.00	11.59	0.00	0.00	11.59	1.53	13.16	11.59	1.10	9.50
Jharkhand	18.12	4.17	23.01	18.12	3.72	20.53	18.12	2.90	16.02	18.12	6.31	34.82
Karnataka	120.09	17.18	14.31	120.09	26.12	21.75	120.09	18.08	15.06	120.09	22.19	18.48
Kerala	26.28	0.65	2.46	26.28	0.53	2.02	26.28	0.48	1.82	26.28	0.43	1.65
Lakshadweep	0.02	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00
Madhya Pradesh	237.14	121.15	51.09	237.14	126.09	53.17	237.14	121.22	51.12	237.14	129.53	54.62
Maharashtra	234.67	83.01	35.37	234.67	72.98	31.10	234.67	58.96	25.12	234.67	88.19	37.58
Manipur	4.37	0.17	3.84	4.37	0.09	2.09	4.37	0.19	4.27	4.37	0.01	0.18
Meghalaya	3.03	0.01	0.33	3.03	0.00	0.01	3.03	0.03	1.12	3.03	0.01	0.23
Mizoram	1.88	0.00	0.00	1.88	0.00	0.00	1.88	0.00	0.00	1.88	0.00	0.00
Nagaland	5.04	0.00	0.00	5.04	0.00	0.00	5.04	0.00	0.00	5.04	0.00	0.00
Odisha	48.03	20.47	42.63	48.03	13.19	27.46	48.03	13.54	28.19	48.03	14.62	30.44
Puducherry	0.26	0.02	7.56	0.26	0.07	28.64	0.26	0.00	0.00	0.26	0.10	38.67
Punjab	78.72	0.00	0.00	78.72	0.00	0.00	78.72	0.00	0.00	78.72	0.00	0.00
Rajasthan	250.14	114.55	45.79	250.14	103.77	41.49	250.14	98.48	39.37	250.14	74.31	29.71
Sikkim	1.37	0.00	0.08	1.37	0.00	0.10	1.37	0.00	0.22	1.37	0.00	0.06
Tamil Nadu	60.74	12.45	20.50	60.74	12.30	20.24	60.74	11.66	19.20	60.74	11.10	18.27
Telangana	48.93	16.07	32.84	48.93	8.22	16.80	48.93	10.46	21.39	48.93	7.77	15.89
Tripura	4.86	0.01	0.21	4.86	0.03	0.58	4.86	0.03	0.63	4.86	0.00	0.02
Uttar Pradesh	262.03	37.98	14.49	262.03	65.11	24.85	262.03	47.08	17.97	262.03	51.34	19.59
Uttarakhand	10.83	1.11	10.26	10.83	1.32	12.22	10.83	1.16	10.75	10.83	1.09	10.07
West Bengal	98.81	8.73	8.84	98.81	19.96	20.19	98.81	16.79	17.00	98.81	18.02	18.23
All India Total	**1970.54**	**523.86**	**26.58**	**1970.54**	**570.84**	**28.97**	**1970.54**	**514.99**	**26.13**	**1970.54**	**519.25**	**26.35**

Source : Department of Agriculture, Cooperation & Farmers Welfare

* Latest data for Gross Area Sown (also known as Gross Cropped Area) is available till 2015-16 and the same has been used for 2016-17 to 2018-19 for estimation purpose