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Crop Insurance: An Economic Review of its Performance in India

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ABSTRACT: India is an agrarian economy with 70 per cent of the total farmers belonging to small and marginal farmers' category (Census, 2011). Agriculture's reliance on the monsoon makes it a dangerous business, and it is the underlying cause of the country's agricultural disaster and farmer suicides. In 2019, over 42.4 thousand farmers and daily wagers committed suicide, an increase of nearly 6 per cent over the previous year (NCRB, 2019). Different alternatives have been developed, with one such mechanism being the implementation of a comprehensive crop insurance system, which cushions the shock of crop loss by assuring protection to farmers against natural hazards which are beyond their control. Although crop insurance has been in the country since 1972, yet it has been beset with several problems such as lack of transparency, high premium, delay in conducting crop cutting experiments and non-payment/delayed payment of claims to farmers. Thus, an attempt has been made in the present study to analyze the growth performance and variability of two most important crop insurance schemes of India viz., NAIS and WBCIS; in order to get a true picture of the current scenario. The results revealed that positive growth rates have been observed for all the aspects under both the schemes during the period of their implementation. For NAIS, maximum growth rate as well as instability index is reported as 10.60 and 79.62 per cent for claims paid to the farmers. The compound annual growth rates computed for number of farmers insured, area insured, sum insured, gross premium, farmers' premium, gross premium collected and number of farmers benefitted were reported as 4.40, 3.81, 8.82, 9.50, 9.45, and 5.83 per cent respectively. Similar to NAIS, the maximum significant growth of 14.10 per cent was observed for the number of farmers benefitted from the scheme. The significant growth rates for sum insured, farmers' premium and gross premium collected have been calculated as 8.22, 11.28 and 11.87 per cent, respectively. However, the number of farmers insured, area insured and number of farmers benefitted under the scheme were also found to increase positively at the rate of 4.14, 1.94 and 6.65 per cent respectively, though not significantly. The progress of newly implemented schemes; PMFBY and RWBCIS have also been analyzed.

Keywords: Crop insurance, NAIS, PMFBY, WBCIS, CAGR, Instability index etc.

INTRODUCTION

Agriculture sector is considered to be the lifeline of Indian economy. Majority of the population's fortunes rely upon the agricultural output in the country. It generates 19.9 per cent of GDP, provides 41 per cent of employment, and sustains 680 million people i.e. nearly half of India's population (Economic Survey of India, 2018-19). Indian agriculture is highly weather-dependent, especially on monsoon. It is considered as an inherently risky venture due to uncertainty in production and market fluctuations, and more so in the context of increased climatic aberrations and globalization. In recent years, the effects of climate change have become more noticeable in the agriculture sector. The crop loss data for the period (1985-2002) indicated that more than 70 per cent of the crop loss was due to drought and about 20 per cent was due to excess rainfall (Parchure, 2002). The Indian crop sector is one of the most vulnerable and exposed to climate change, owing to a lack of adaptive capacity to deal with the consequences of the change (Birthal *et al.*, 2014). Continuous crop failures are supposed to be associated with increasing number of farmers' suicides

and due to this, India is poised to become the farmer suicide capital of the world (Joy, 2019). A total of 10,349 farmers committed suicide in 2018. More than half of total farmers' suicide cases have been reported in Maharashtra (34.7%) and Karnataka (23.2%). Other states facing suicide issues are Telangana (8.8%), Andhra Pradesh (6.4%) and Madhya Pradesh (6.3%) (Poovanna & Das, 2020).

Different adaptation approaches have been evolved at different levels to overcome these threats and uncertainties. On one hand, Government is engaged in providing tax reductions, waiving off loans and interest on loans, drought or flood relief measures, etc. Farmers, on the other hand, attempt to reduce risks by utilizing modern technology, diversifying the agricultural operations through intercropping, flexible use of fertilizers, pesticides, etc. Crop insurance is one such effective mechanism that provides economic support to farmers, stabilize their income and further induce them to invest in agriculture by reducing indebtedness and providing the much needed relief measures during the time of crop failure. The basic concept underlying crop insurance is that loss incurred by a few is shared among others in a region, engaged in a similar activity. In fact, losses suffered during bad years are offset from wealth gained in good years (Dandekar, 1976). It is a process in which payment of a certain significant amount of premium guarantees the receipt of a larger amount of compensation, depending upon the occurrence of an uncertain event.

In India, crop insurance plays a significant role in controlling risks in the Indian agriculture sector. Different crop insurance schemes have been implemented in India from time to time. India's first systematic attempt towards crop insurance was based on individual farm approach, which was subsequently dissolved for being unsustainable. The next insurance scheme was based on homogeneous area approach. After that, Comprehensive Crop Insurance Scheme (CCIS) was implemented in 1985; wherein improvements based on area approach were introduced by linking with short-term crop credit. Later on, National Agricultural Insurance Scheme (NAIS) and Weather Based Crop Insurance Scheme (WBCIS) were implemented to increase the coverage of farmers by covering various kinds of risks. However, despite the modifications, these schemes failed to cover all the farmers. Then, in 2016, the government modified WBCIS as RWBCIS and also introduced Pradhan Mantri Fasal Bima Yojana (PMFBY) to weed out the issues in the previous crop insurance schemes.

The present paper attempts to examine the growth performance of two most important previously operative schemes, i.e. NAIS and WBCIS in India by computing the CAGR and index of instability. The progress of PMFBY and RWBCIS have also been analyzed.

MATERIALS AND METHODS

The study is mainly based on secondary data. The data on various aspects of major crop insurance schemes were collected from various publications and reports of Agriculture Insurance Company of India Limited and official government websites. To examine the growth performance of various schemes, compound annual growth rates were computed for number of farmers covered under the scheme, total area covered, total premium collected, total subsidy amount received, total claims amount paid and number of farmers benefitted by employing the following formulae:

A. Compound growth rate

The compound annual growth rate of different variables under crop insurance had been computed. For this following form of exponential function was used:

$$Y_t = Y_0 (1+r)^t \quad (1)$$

Where,

Y_t = Dependent variable for which growth rate id estimated in t^{th} year

Y_0 = Dependent variable in initial year

r = Compound growth rate

t = 1, 2, 3……..years.

The log transformation of above equation becomes

$$\text{Log } Y_t = \text{Log } Y_0 + t \text{ Log } (1+r) \quad (2)$$

Assuming Log Y_0 = Log a and Log (1+r) = b, the same expression could be put as:

$$\text{Log } Y_t = \text{Log } a + bt \quad (3)$$

This is same as the log-linear form of the exponential function. From this log-linear form, CAGR is worked out as follows by differentiating it with reference to 't'

$d (\text{Log } Y_t) / dt = b$

But the estimate of 'b' in the log-linear function is in semi-log term. Therefore, to convert it into original form of Y_t following transformation is done:

Since, b = log (1+r)

Antilog (b) = 1 + r

r = (antilog b) – 1

CAGR in percentage = [(antilog b) – 1] × 100

B. Instability Index

An index of instability was computed for the different variables associated with crop insurance schemes to examine the nature and degree of instability in their growth. Cuddy Della Valle Index have been used as a measure of instability as co-efficient of variation (CV) alone, does not explain properly the trend component inherent in the time series data and is computed as follows:

Cuddy Della Valle Instability Index:

$$I = CV \times \sqrt{(1 - \bar{R}^2)}$$

where,

I = Instability index (per cent)

CV = Coefficient of variation (per cent)

$\bar{R}^2$ = Adjusted coefficient of determination

RESULTS AND DISCUSSION

India is not very new to the idea of crop insurance. Different changes have been introduced in the scheme from time to time and it is still growing with respect to its methodologies, scope and practices. There is a great need of crop insurance in India to provide economic support to farmers, stabilize their income and reduce the load of indebtedness which will induce them to further invest in agriculture.

There were three crop insurance schemes operating in India upto 2016 viz., National Agriculture Insurance Scheme (NAIS), Modified National Agriculture Insurance Scheme (MNAIS) and Weather Based Crop Insurance Scheme (WBCIS). But these schemes failed to meet the expected results due to lack of transparency, high premium rates, delay in conducting crop cutting experiments and non-payment or delayed payment of claims to the farmers (Gulati *et al*., 2018). Realizing the shortcomings of the existing crop insurance syatem, a new crop insurance scheme named as "Pradhan Mantri Fasal Bima Yojana" (PMFBY) was launched by the government from Kharif 2016. The major highlights of the scheme were: Premium rates were fixed for the farmers at 2 percent in *kharif* season and 1.5 percent in *rabi* season, leading to a substantial rise in government premium subsidies. Besides this, elimination of capping on premium rates, smart Crop Cutting Experiments (CCEs), digitalization of land records and their linking with farmers' accounts for faster settlement of claims were some other important initiatives taken for effective implementation of new crop insurance scheme. During the same period, WBCIS was modified and renamed as Restructured Weather Based Crop Insurance Scheme (RWBCIS) where the premium rates have been made at par with that under PMFBY.

In the present study, an attempt has been made to analyze the performance of previously operative crop insurance schemes in India by computing the growth and instability of different variables associated with them.

Table 1: Growth performance of National Agricultural Insurance Scheme (NAIS) in India.

Sr. No.	Year	No. of farmers insured (No in lakh)	Area insured (Ha in lakh)	Sum insured (Rs.in crores)	Farmers' Premium (Rs.in crores)	Gross Premium (Rs.in crores)	Claims Paid (Rs.in crores)	No. of Farmers Benefitted (No in lakh)
1.	1999-00	5.80	7.81	356.41	3.77	5.42	7.69	0.55
2.	2000-01	105.01	163.31	8506.07	178.89	234.52	1281.97	41.62
3.	2001-02	106.52	160.34	8999.97	236.37	291.77	558.29	21.95
4.	2002-03	120.96	195.70	11269.24	312.38	363.97	2012.94	52.24
5.	2003-04	123.92	188.24	11163.62	316.70	347.39	1149.79	38.10
6.	2004-05	162.18	296.17	16944.82	510.58	534.80	1198.92	34.48
7.	2005-06	167.22	277.49	18590.76	529.11	554.77	1424.75	36.68
8.	2006-07	179.12	273.05	21301.58	572.24	610.17	2292.19	45.23
9.	2007-08	184.43	281.42	24474.61	638.38	683.03	1725.54	31.71
10.	2008-09	192.03	264.94	26814.78	701.54	807.66	3887.62	61.99
11.	2009-10	239.34	336.70	38624.21	1022.47	1154.55	5118.10	90.12
12.	2010-11	176.50	240.48	34721.45	880.36	1019.95	2299.71	33.92
13.	2011-12	167.94	233.86	34771.04	856.51	972.03	2208.99	31.32
14.	2012-13	167.91	243.85	42909.15	1041.65	1326.35	4895.34	44.68
15.	2013-14	137.20	207.08	41554.15	1025.21	1275.19	4323.62	38.09
16.	2014-15	167.38	207.70	45880.82	1154.31	1398.10	4285.74	64.12
17.	2015-16	309.08	339.05	80622.09	2018.81	2537.24	17485.30	182.53
	CAGR	4.40*	3.81*	8.82**	9.50**	9.45**	10.60**	5.83*
	Instability index	31.13	28.51	39.48	42.85	44.25	79.62	62.95

Note: ** and * indicate 5 per cent and 1 per cent level of significance respectively.

National Agricultural Insurance Scheme (NAIS) was introduced by the GOI in collaboration with the General Insurance Corporation of India (GIC) 1999-2000 (r*abi*). Later on, Agricultural Insurance Company of India Ltd. (AICIL) took over the implementation from 2003. The salient features of the scheme were:

- Scheme was made available both the loanee and non-loanee farmers irrespective of the size of holding.
- Crops covered: all food crops (cereals, millets and pulses), oilseeds and annual commercial/horticultural crops.
- It was a yield guarantee scheme which was operating on "Area approach" basis.

In the present study, compound growth rates have been computed for number of farmers insured, area covered, sum insured, farmers' premium, gross premium collected, claims paid and number of farmers benefited in India during the period of its operation (1999-2000 to 2015-16). Table 1 indicates that positive growth rates have been observed for all the aspects. However,

highest significant growth rate of 10.60 per cent has been observed for claims paid to the farmers. This indicates a kind of loss to the government. On the other hand, growth rates computed for number of farmers insured, area insured, sum insured, gross premium, farmers' premium, gross premium collected and number of farmers benefitted were observed as 4.40, 3.81, 8.82, 9.50, 9.45, and 5.83 per cent respectively.

The index of instability has also been computed for the above mentioned variables to examine the variability in the performance of NAIS. The results revealed that highest instability has also been reported in case of claims paid to the farmers (79.62 per cent). This was followed by the number of farmers benefitted where the instability index was found to be quite high as 62.95 per cent; which became one of the major reasons for the failure of the scheme in India. The index of instability for number of farmers insured, area insured, sum insured, farmers' premium and gross premium collected were computed as 31.13, 28.51, 39.48, 42.85 and 44.25 per cent respectively.

Weather Based Crop Insurance Scheme (WBCIS) is another important yet a unique crop insurance scheme intended to provide insurance coverage against crop yield losses caused by adverse weather incident. This scheme makes use of the weather parameters as "proxy" in compensating the farmers for considered crop losses. The development of pay-out structures is based on the losses deemed to have been suffered using the weather triggers. This scheme was also operative on "Area Approach", where for the purpose of compensation, a 'Reference Unit Area' (RUA) shall be considered as homogeneous unit of insurance. Based on distance and location and availability of Automatic Weather Stations/Rain Gauge, state government approves Research Weather Station (RWS) for each Reference Unit Area (RUA). In addition to RWS, one Backup Weather Station (BWS) is also notified for each RUA in case RWS is unable to provide data for any reason.

Table 2: Growth performance of Weather Based Crop Insurance Scheme (WBCIS) in India.

Sr. No.	Year	No. of farmers insured (No in lakh)	Area insured (Ha in lakh)	Sum insured (Rs. in crores)	Farmers' Premium (Rs. In crores)	Gross Premium (Rs. In crores)	Claims Paid (Rs. in crores)	No. of Farmers Benefitted (No in lakh)
1.	2007-08	6.78	10.68	1791.91	45.19	148.35	105.64	2.26
2.	2008-09	3.75	4.82	887.43	20.84	81.69	49.48	2.30
3.	2009-10	23.63	34.22	5503.30	119.37	449.90	344.42	15.03
4.	2010-11	93.00	131.39	14310.69	344.43	1289.37	634.25	43.17
5.	2011-12	116.71	156.34	20209.43	540.03	1844.31	1091.43	63.30
6.	2012-13	136.00	171.12	23526.00	662.10	2217.78	1575.54	108.05
7.	2013-14	141.57	165.13	25525.89	971.65	2393.77	1950.57	107.22
8.	2014-15	112.52	127.75	17643.07	938.82	2122.36	2015.95	96.24
9.	2015-16	90.31	94.36	14737.14	787.00	1721.32	1962.67	75.19
	CAGR	4.14	1.94	8.22*	11.28**	11.87**	14.10**	6.65
	Instability index	40.28	43.92	40.80	34.63	36.50	32.59	37.47

Note: ** and * indicate 5 per cent and 1 per cent level of significance respectively.

Table 2 indicates the growth performance of WBCIS in India during the period of its operation from 2007-08 to 2015-16. The results revealed that progressive growth rates have been found for all the aspects of the scheme as obtained by Sharon, *et al.* (2019). Similar to NAIS, the maximum significant growth of 14.10 per cent was observed for the number of farmers benefitted from the scheme. The significant growth rates for sum insured, farmers' premium and gross premium collected have been calculated as 8.22, 11.28 and 11.87 per cent, respectively. However, the number of farmers insured, area insured and number of farmers benefitted under the scheme were also found to increase positively at the rate of 4.14, 1.94 and 6.65 per cent respectively, though not significantly. Further, the index of variability has also been computed to study the variability in the above mentioned parameters. It was highest as 40.80 per cent in case of sum insured followed by 40.28 per cent in case of number of farmers insured under the scheme over the years. However, these two schemes couldn't make it for long because of the several shortcomings reported. These schemes faced various challenges like low penetration in the country, delay in settlement of claims, lack of awareness among the farmers, lack of comprehensive model and high premium rates. Thus, despite numerous modifications, these schemes failed to cover all farmers and to weed out the issues in the previous crop insurance schemes, Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched in 2016.

PMFBY was launched with the tagline of 'one nation, one scheme'; aims to stabilize farm income, ensure the flow of credit to farmers and encourage them to innovate and use modern agricultural practices (Rai, 2019). PMFBY has made several improvements upon its predecessors; most important of them are:

• A uniform rate of premium was fixed to be paid by farmers; 2 per cent for all *kharif* crops, 1.5 percent for *rabi* crops, and five percent for commercial and horticultural crops or actuarial rate, whichever is less; with no upper limit on government premium subsidies.
• The scheme was mandatory for loanee and voluntary for non-loanee farmers.
• It involves bidding between insurance firms before assigning an area to ensure fair competition.
• This scheme also operates on an area approach. Thus, all farmers in a particular area will pay equal premium and will have equal claim payments.

Table 3: Performance of Pradhan Mantri Fasal Bima Yojana (PMFBY) in India.

Year	No. of farmers insured (no. in lakh)	Area insured (ha in lakh)	Sum insured (Rs. in crores)	Farmers' Premium (Rs. in crores)	Gross Premium (Rs. in crores)	Claims Paid (Rs. in crores)	No. of farmers benefitted (No. in lakh)
2016-17	577	567	2,03,400	4201	21946	16389	143
2017-18	522	520	2,07,896	4485	25501	20839	156
2018-19	564	508	235277	4876	28802	17547	165

Table 3 indicates the performance of PMFBY over the past three years since its inception. The number of farmers covered under the scheme were 577 lakhs in the initial year; showing an increase of nearly 267 lakhs when compared to the previous year under the NAIS. However, it has decreased by around 2 per cent to 564 lakh in the year 2018-19. Similarly, the area insured under the scheme as declined by nearly 10 per cent from 567 lakh ha in 2016-17 to 508 lakh ha in 2018-19. The number of farmers benefitted from the scheme has observed a positive increase of around 15 per cent; from 143 lakh in 2016-17 to 165 lakh in 2018-19. But the scheme has failed to achieve its main targets, i.e. increasing the area and number of farmers insured.

Table 4: Performance of Restructured Weather Based Crop Insurance in India (RWBCIS) in India.

Year	No. of farmers insured (no. in lakh)	Area insured (ha in lakh)	Sum insured (Rs. in crores)	Farmers' Premium (Rs. in crores)	Gross Premium (Rs. in crores)	Claims Paid (Rs. in crores)	No. of farmers benefitted (No. in lakh)
2016-17	21.00	17.18	10060.72	404.08	1631.78	1658.29	17.22
2017-18	20.23	20.34	12650.85	459.64	2363.22	1871.82	15.90
2018-19	21.26	19.95	16059.15	568.42	2891.56	2656.21	13.94

With revised operational guidelines, RWBCIS was introduced from *kharif*, 2016. Table 4 indicates the progress of RWBCIS in India since its inception. The number of farmers covered under the scheme has remained relatively stable over time. But the area insured has increased from 17.18 lakh in 2016-17 to 19.95 lakhs in 2018-19. However, the number of farmers benefitted has declined from 17.22 in 2016-17 to 13.94 in 2018-19; showing a decrease of nearly 19 per cent as compared to initial year.

Although these schemes were introduced with an aim to yield more positive outcomes but due to fundamental issues and poor implementation, they failed to achieve the desired targets. It has been observed that only 50 districts have repeatedly accounted for 50 per cent of all claims under PMFBY, year after year (Jayan, 2019).

To further improvise the system of crop insurance in India, the Cabinet has recently approved revamping of PMFBY and RWBCIS for a period of 3 years from (*kharif*, 2020) to (*rabi*, 2023). In this, some major changes have been introduced like:

• The schemes have been made voluntary for all the farmers.
• The share of central government has been reduced from 50% to 25% in irrigated areas and 30% for un-irrigated areas.
• Centre has made it compulsory for the States to allow insurance firms to operate for three years.

Since the beginning, government is trying with all its efforts to make crop insurance in India, a success. Although the government has made numerous attempts to address the grievances of farmers, the policies are unsatisfactory, weighed down by their being merely ad hoc and subject to political wrangling. Thus, comprehensive efforts backed by private and public partnership along with the technological advancements, if included can protect the farming community.

CONCLUSION

The world has changed immensely over the years and there is an urgent need to bring that change in agriculture sector as well. Crop insurance schemes have been in existence in India, since a long time, but have failed to cover most of the agriculture sector (Rajeev and Nagendran, 2019). The above study demonstrated the progress of the previously operative schemes in

India. Results revealed that positive growth rates of 4.40 per cent and 4.14 per cent have been attained in the number of farmers covered under NAIS and WBCIS respectively, over the study period. However, it has been reported that 86.86–94.25 per cent of small and marginal farmers were not covered during the *kharif* seasons, while 94.38–97.28 per cent were not covered during the *rabi* seasons from 2011 to 2016 (Rao, 2019). Further, indemnity level is quite less, which need to be increased so that more number of farmers opt for the same (Kumbalep and Devaraju, 2018). Therefore, the present study stresses the need to identify the gaps in the system. It is important to analyze the issues and problems related to crop insurance, so that the loopholes can be filled and the system can be improved for securing the agrarian livelihood in India.

Conflict of Interest. None.

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