

## Weather Based Crop Insurance – Promises and Challenges

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Situation Assessment Survey of Agricultural Households by NSSO (70th Round, January-December 2013) reports that very small segment of agricultural households utilised crop insurance, lack of awareness being the most reported reason. Inevitability of crop insurance need no over emphasis today amidst frequent and severe risks facing agriculture from increasing global temperatures, erratic rainfall, catastrophes, pests and diseases. With a history of over four decades involving various pilot insurance schemes and National Insurance Schemes like NAIS, MNAIS and WBCIS, the insurance penetration has reached only one fourth of the farmers or crop area. Weather Based Insurance, however, depicts promise in terms of lower claims ratio but has challenges in terms of density and reliability of weather stations. An insurance product mix combining the better elements of both yield-based and weather-based insurance, probably, could translate into viability and wider acceptability to both the insured and the insurer.

### Introduction

The situation Assessment Survey of Agricultural Households in its 70th round (January – December, 2013), conducted by the National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation, indicated that very small segment of agricultural households utilised crop insurance. A very small segment of agricultural households insured their crops against possible crop loss. The details are presented in Table 1.

As per the survey, among the reasons for not insuring the crops, lack of awareness was the most prominent one. Other reasons were non interest, no felt need, insurance facility not available, lack of resources for premium payment, not satisfied with terms & conditions, long bank distance, complex procedures, delay in claim payment, etc.

Against this background various crop insurance schemes implemented in the country with focus on Weather Based Crop Insurance Scheme (WBCIS) is presented in the following ;

### Crop Insurance Journey

Although, references are made to the idea of introducing crop insurance in India, which existed in the form of proposed rainfall insurance scheme for Mysore state in 1920 and a few others, the program started in 1972 on H-4 cotton in Gujarat which was later extended to a few other crops and states. The program covered merely 3,110 farmers in a span of 6 years from 1972 to 1978 and was replaced by a Pilot Crop Insurance Scheme (PCIS). PCIS covered food crops (cereals, millets & pulses), oilseeds, cotton & potato and was confined to borrowing farmers on a voluntary basis. The scheme was implemented in 13 states and covered about 6, 27,000 farmers from 1979 to 1984. The Comprehensive Crop Insurance Scheme (CCIS 1985-1999) was an expansion of PCIS, made compulsory for borrowing farmers. Sum insured which was initially 150 percent of the loan amount, reduced to a maximum of Rs. 10,000 per farmer. Premium rates were 2 percent of the sum insured for cereals & millets and 1 percent for pulses & oilseeds, with premium and claims shared between the Centre & States in 2:1 ratio. The scheme when wound up in 1999, was implemented in 16 States & 2 Union Territories and cumulatively covered about 763 lakh farmers.

**Table 1 : Per 1000 distribution of agricultural households not insuring their crops by reason for selected crops**

period: July, 2012- December, 2012

crop	no per 1000 of households not insuring crops due to						no. per 1000 hhs insuring this crop
	not aware	not aware about availability of facility	not interested	no need	insurance facility not available	lack of resources for premium payment	
Paddy	432	185	152	52	62	37	48
Jowar	435	129	154	42	57	49	79
Bajra	512	175	144	56	42	41	62
Maize	464	186	122	47	71	39	46
Wheat	208	131	191	58	158	80	47
Gram	301	153	235	27	46	79	89
Arhar(tur)	411	163	147	33	93	60	82
Urad	522	192	118	38	62	15	69
Moong	480	145	191	11	46	50	102
Sugarcane	388	211	131	93	67	36	13
Groundnut	489	179	158	35	49	25	245
Sesamum	480	237	122	20	19	79	147
Coconut	336	114	244	131	56	20	48
Sunflower	104	232	147	60	194	79	36
Safflower	0	654	0	0	0	0	332
Soyabean	448	160	176	28	40	60	140
Cotton	396	140	173	26	100	79	104

Source : Key Indicators of Situation of Agricultural Households in India, NSS 70th Round (Jan-Dec, 2013), NSSO, December 2014.

### Box 1 : The Birth of Crop Insurance

Benjamin Franklin is likely to be the first person to have thought of Crop Insurance. Based on a severe storm of 24th October 1788 in French countryside which destroyed crops, he observed – “I have sometimes thought that it might be well to establish an office of insurance for farms against the damage that may occur to them by storms, blight, insects etc. A small sum paid by a number of farms would repair such losses and prevent much distress”. However, the first crop insurance programme in the form of hail insurance started in 1820s in France and Germany for Grapes, while it started in USA in 1883 for tobacco crop. The earliest Multi-Peril Crop Insurance (MPCI) started in USA in 1939, with formation of Federal Crop Insurance Corporation (FCIC).

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The National Agricultural Insurance Scheme (NAIS) replaced CCIS starting from Rabi 1999-00 season, administered by Agriculture Insurance Company of India Limited (AICI), providing coverage to approximately 35 different types of crops during the Kharif season and 30 during the Rabi season. Large Insurance unit area which was rarely homogenous, non-reflection of pre-sowing and post-harvest losses in the yield index, huge infrastructure and manpower required to conduct over couple of million crop cutting experiments, delay in settlement of indemnities, and coverage of only those crops where historical yield data is available, were some of the shortcomings of the NAIS.

Improved version of NAIS titled 'Modified NAIS' (MNAIS) was implemented from Rabi 2010-11 season in 50 districts. MNAIS, had to a large extent, taken care of the lacunae in the existing NAIS, viz., insurance unit for major crops was reduced to village panchayat or other equivalent unit, claims upto 25 percent of the sum insured was payable in case of prevented / failed sowing, minimum indemnity level made 70 percent (instead of 60 percent as in NAIS), premium rates are actuarial supported by up-front subsidy in premium, ranging from 25 percent to 75 percent, were equally shared by Centre and States. However some issues confronted MNAIS, which included increase in work load required for crop cutting experiments (CCEs) due to lowering of insurance unit, and higher share by farmers (50 percent) in the cost of the insurance under MNAIS compared to only 30 percent under NAIS.

These traditional crop insurance schemes still faced a few issues relating to area discrepancy, i.e. area insured for a particular crop being more than the crop area sown, delay in receiving crop-cutting data, quality and reliability of such data, non-compliance with the provision of compulsory insurance for loanee farmers, multiple loans on the same land, affordability of insurance premium for the farmers, delay in settlement of claims, high indemnity payouts compared to premium collection, etc.

## Weather Based Crop Insurance Scheme

Weather based crop insurance product was intended to address problems of traditional crop insurance products like moral hazard, high administrative cost, delay in settlement, low verifiability, etc.

Weather Based Crop Insurance aims to mitigate the hardship of the insured farmers against the likelihood of financial loss on account of anticipated crop loss resulting from incidence of adverse conditions of weather parameters like rainfall, temperature, frost, humidity, etc. Beginning of the 21st century witnessed policy attention to weather index based crop insurance. World Bank initiated pilots of this form of crop insurance in low income countries where traditional crop insurance

could not take off. 'Weather index' insurance works on the quantitative relationship between weather parameters and crop yields. Countries like Mexico, India, Ukraine, Malawi, Ethiopia and China have been running pilots of weather index based crop insurance for some years.

The first pilot on weather index insurance in India was carried out in 2003 by ICICI Lombard which was followed by pilots on weather risk index-based insurance by AICI and IFFCO-Tokio, both during 2004. Building on the existing weather risk insurance products, AICI designed the Weather risk-Based Crop Insurance Scheme (WBCIS) and is in implementation since Kharif 2007. Various constructs based on weather parameters used in WBCIS are presented in Table 2.

From the Rabi 2007 season, insurers from private sector were also allowed by the Government to participate in WBCIS; initially for non-loanee farmers and subsequently for both loanee and non-loanee farmers. The insurers from private sector along with AICI developed parametric weather risk based crop insurance for a variety of crops ranging from seasonal to perennial crops and low value to high value crops.

The implementation of WBCIS has covered 18 States in 2013. The highest coverage of farmers and area was in Rajasthan at 30.82 million farmers and 42 million hectares respectively, followed by Bihar at 8.89 million farmers and 9.4 million hectares. During the period of six and a half years from 2007-08 to 2012-13 (kharif 2007 to kharif 2013) 46.94 million farmers and 63.2 million hectares of area was insured under WBCIS. Business parameters of WBCIS are presented in Table 3.

## Present Scenario

The Government has introduced National Crop Insurance Programme (NCIP)/Rashtriya Fasal Bima Karyakram (RFBK) from Rabi 2013-14 season with the component schemes of Modified National Agricultural Insurance Scheme (MNAIS) and Weather Based Crop Insurance Scheme (WBCIS). The premium rates under MNAIS and WBCIS are on higher side as compared to earlier scheme of NAIS. This is because there are several improvements and additional benefits to the farmers under these schemes. Further, premium being charged are on actuarial basis and claim liability is at present on the insurance company. However, to make the premium affordable to the farmers, Government is providing upfront subsidy upto 75% under MNAIS and upto 50% under WBCIS. The risk cover will be available for standing crops (sowing to harvesting), prevented sowing/planting risk and post-harvest losses due to cyclone (in coastal areas). etc.. Coverage would include food crops, oilseeds and annual commercial and horticultural crops.

**Table 2 : Constructs Used in Weather Index based Insurance**

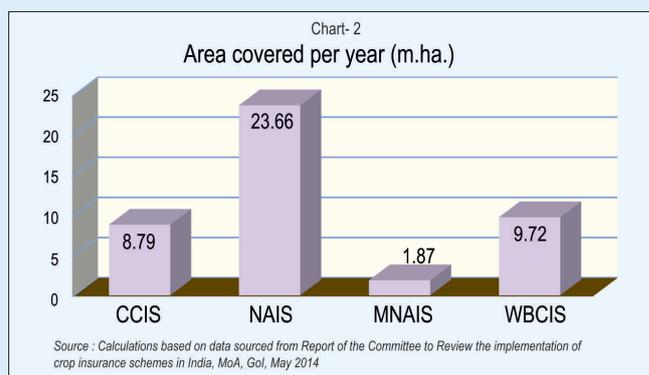
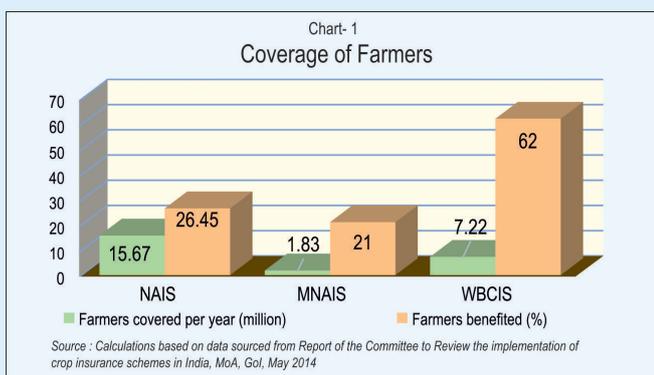
S. No.	Weather Parameter	Components
1	Rainfall	Deficit rainfall, Consecutive Dry Days (CDD), Number of Rainy Days, Excess rainfall, Consecutive Wet Days (CWD)
2	Temperature	Max. Temperature (heat), Min. Temperature (frost), Mean Temperature, Hourly Chilling units
3	Relative Humidity	High Humidity
4	Wind Speed	High Wind Speed
5	Disease proxy	Combination of Weather parameters like rainfall, temperature & humidity

Source: Report of the Working Group on Outreach of Institutional Finance, Cooperatives and Risk Management, 12th FYP, Planning Commission, November 2011.

**Table 3. Business parameters of WBCIS**

Year/ Season	Farmers insured ('000)	Area insured ('000 ha)	Sum insured (Rs. cr)	Gross premium (Rs. cr)	Claims (Rs. cr)	Farmers benefitted ('000)	Farmers benefitted (%)	Claim Ratio as % (Claims/ Premium)	Loss cost (claims as % of sum insured)
2007-08	679	1068	1792	148.3	105	226	33	70.8	5.86
2008-09	376	482	887	81.7	49	230	61	59.9	5.52
2009-10	2363	3422	4974	447.6	345	1503	64	77.1	6.94
2010-11	9305	13148	14331	1291.1	635	4319	46	49.2	4.43
2011-12	11675	15733	20725	1844.6	1176	6330	54	63.8	5.67
2012-13	13614	18117	23604	2224.2	1931	10798	79	86.8	8.18
2013 (K)	8927	11230	14638	1481.7	1043	5601	62	70.4	7.12
<b>Total</b>	<b>46939</b>	<b>63200</b>	<b>80951</b>	<b>7519.2</b>	<b>5284</b>	<b>29007</b>	<b>62</b>	<b>70.2</b>	<b>6.5</b>

Source : Calculations based on data sourced from Report of the Committee to Review the implementation of crop insurance schemes in India, MoA, GoI, May 2014



### Comparison of crop insurance schemes

Various crop insurance schemes implemented in the country are compared with respect to coverage of farmers and the results are presented in Chart 1. It could be seen that the coverage of farmers was the highest at 15.67 million farmers per year under NAIS while the percentage of farmers benefitted was the highest under WBCIS at 62 per cent compared to 26 per cent under NAIS.

Area covered under crop insurance was 23.66 million hectare per year under NAIS followed by WBCIS at 9.72 million hectare per year. The results are presented in Chart 2.

The pay out under various crop insurance schemes implemented are compared using the claims ratio. Claims ratio is the total claims divided by the total gross premium. This figure indicates the percentage payout in relation to the premium collected. High claims ratio could indicate one or several reasons like low coverage of farmers, low premium rate,

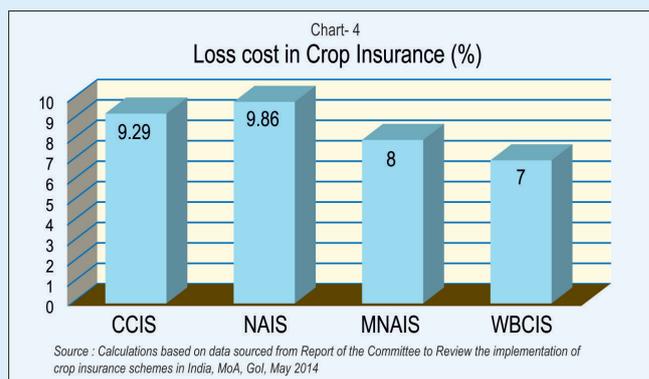
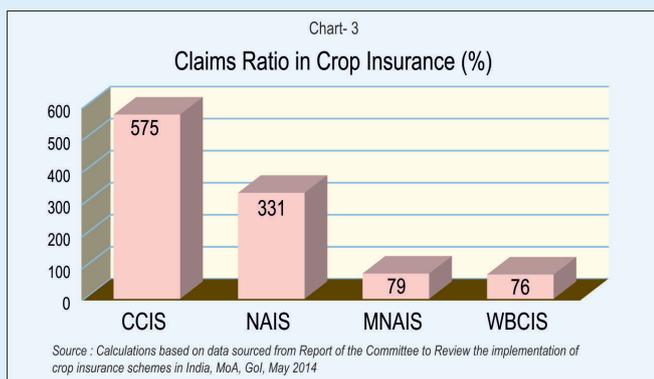
moral hazard, etc. and vulnerability of the crop insurance business. The claims ratio of crop insurance schemes are compared in Chart 3. The results indicate that the WBCIS had the lowest claim ratio.

Similarly, loss cost percentage, which is the total indemnity payouts as a percentage of the total liability in terms of sum insured was also the lowest in WBCIS (Chart 4). The coverage of crops under WBCIS was broad based as compared to concentration in crops like groundnut in CCIS and paddy in NAIS and MNAIS (Chart 5).

An evaluation study on WBCIS conducted by AFC during 2010 indicated that as many as 80 percent of the respondents were not satisfied with location of weather station, highlighting the basis risk. WBCIS thus has promising aspects and challenges.

### Promising facts

- Payouts made faster, insurance contract is more transparent and the transaction costs are lower.



- Ability to mitigate even small to moderate losses and also provide extended coverages like for pre-sowing periods and quality of output which are difficult to cover under other schemes
- Due to use of objective/publicly available data, less susceptible to moral hazard.
- No need of historical yield data
- Large amount of literature is available on weather index insurance, mostly commissioned by the World Bank.

## Challenges in WBCIS

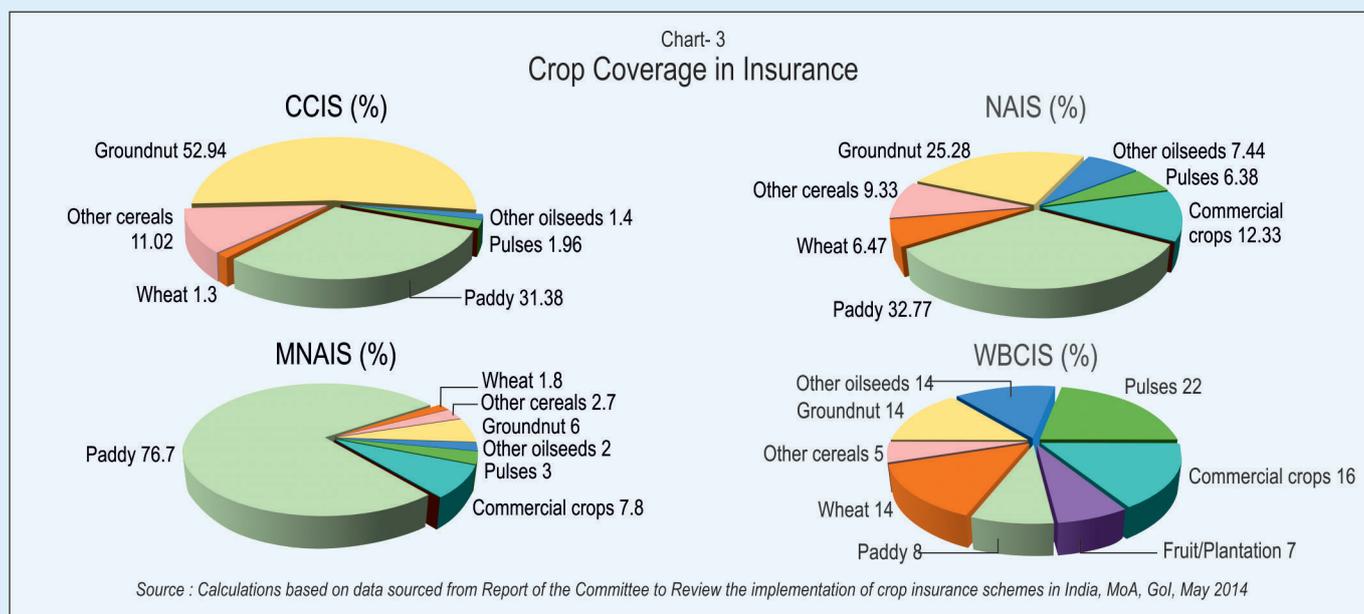
The performance of weather risk index-based insurance depends on the strength of crop yield and weather relationship, accuracy and transparency of weather data and quick claims settlement. The weather insurance product should be technically sound, simple and easily accessible to farmers. Farmers must be able to understand the products sufficiently in order to calculate claims and expect realistic payouts. Few challenges facing WBCIS, therefore, are the following.

- Designing a proxy weather risk index with high predictive capability to realistically measure crop losses.
- Reducing the basis risk. Basis risk arises when the actual experience of weather risk (rainfall) in the neighbourhood significantly differs from the data recorded at the weather station which may not trigger a payout despite the occurrence of damages at an individual farm, or may trigger a payout when loss did not occur.
- Inclusion of perils like hailstorm, flooding, pests & diseases emanating from weather aberrations, etc.

## Policy pointers

The findings of the NSSO survey that only a segment of agricultural households utilised crop insurance indicates non-conformity to the basic insurance principle of 'law of large numbers'. While massive awareness creation, making crop insurance facilities easily available and universally acceptable to all the farmers are the ideal requirements, the past experience are lessons for making better crop insurance products which could address problems of moral hazard, low payouts, high administration costs, delays in claim settlement, etc. WBCIS, with better coverage of farmers and crops, low claims ratio and loss cost appears to hold promise provided :

- Research inputs facilitate fine-tuning of the weather-yield relationship as WBCIS experience reveals instances of crop losses due to weather deviations, which could not be entirely captured by the weather index.
- The basis risk is minimised by increasing density of weather stations coupled with facilities for third party accreditation and calibration services to certify for reliability and accuracy of the data.
- Technology is upgraded to monitor weather parameters using remote-sensing technologies that could capture weather borne risks more accurately given the presence of micro climate and spatial distribution of agricultural holdings.
- A combination of area yield index and weather index based insurance product is offered until all perils are covered and technologies are stabilised to capture them under weather risk index.
- A scheme is introduced for incentivising farmers for no claim crop season in the form of premium holiday/rebate.



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