Agricultural Livelihoods and Crop Insurance in India

Situation Analysis & Assessment

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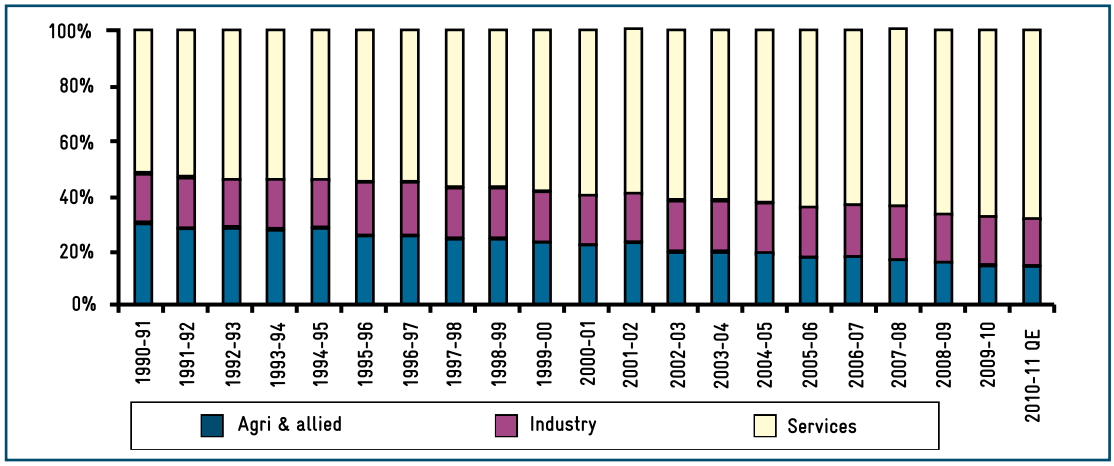
Study Project:
Risk Reduction through
Rural Insurance Services

Contents

1. Situation Analysis

1.1 Important Trends in Agricultural Development[1]

Agriculture is a critical sector of the Indian economy. It has undergone significant structural changes in the form of decrease in its share of GDP from 30% in 1990-91 to 14.5% in 2010-11 indicating a shift from the traditional agrarian economy towards a service dominated one. This decrease in agriculture's contribution to GDP has not been accompanied by a matching reduction in the share of agriculture in employment. About 52% of the total workforce is still employed by the farm sector which makes more than half of the Indian population dependant on agriculture for sustenance (NSS 66th Round). Being both a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society, the significance of agriculture to the Indian state cannot be judged solely by the traditional yardsticks of economic contribution.



Source: Central Statistical Organisation (CSO)

The experience from BRICS countries indicates that a one percentage growth in agriculture is at least two to three times more effective in reducing poverty than the same growth emanating from non-agrarian sectors. According to the last two Five Year Plans: for the Indian economy to grow at 9% per annum, it is important that the agriculture sector should grow at least by 4% per annum.

The average size of operational holdings in India has diminished progressively from 2.28 ha in 1970-71 to 1.55 ha in 1990-91 to 1.23 ha in 2005-06. As per the Agriculture Census 2005-06, the proportion of marginal holdings (less than 1 ha) has increased from 61.6% in 1995-96 to 64.8% in 2005-06. This is followed by about 18% small holdings (1-2 ha.), about 16% medium holdings (more than 2 to less than 10 ha.) and less than 1% large holdings (10 ha. and above).

The growth performance of the agriculture sector has been fluctuating across the plan periods. It witnessed a growth rate of 4.8% during the eighth plan period (1992–97). However, the agrarian situation saw a downturn towards the beginning of the ninth plan period (1997–2002) and the tenth plan period (2002–07), when the agricultural growth rate came down to 2.5% and 2.4% respectively. The Eleventh Plan (2007-12) had sought to reverse the deceleration of agricultural growth in its preceding plans. Agricultural GDP growth has accelerated to

1 This section draws significantly from Chapter 1 titled Indian Agriculture: Performace and Challenges of a review document 'State of Indian Agriculture 2011-12' prepared by the Ministry of Agriculture & Cooperation, Government of India

an average 3.9% during 2005-06 to 2010-11. The Approach Paper to Twelfth Plan (2012-17) drafted by the Planning Commission estimates that the average growth in agriculture & allied sectors in the eleventh plan may be 3.3 - 3.5% per year against a target of 4%.

It is also significant that unlike the overall economic growth pattern, agricultural performance in India has been quite volatile (the Coefficient of Variation (CV) during 2000-01 to 2010-11 was 1.6 compared to 1.1 during 1992-93 to 1999-2000). This is almost six times more than the CV observed in the overall GDP growth of the country indicating that high and perhaps increasing volatility is a real challenge in agriculture. The volatility in agricultural performance is likely to increase in the years to come in the wake of climate change.

One of the key indicators and driving factors of agricultural growth is GCF (Gross Capital Formation) in agriculture, stated as a percentage of agri-GDP (GDP from agriculture). GCF in agriculture & allied sector increased from 7.0% during the First Plan (1951-56) to 10.8% during the Fifth Plan (1974-79) after which it followed a declining trend up to the Eighth Plan (1992-97) when it came down to 8.8%. From the Ninth Plan (1997-2002) onwards, a reversal in trend has been achieved resulting in an increase in GCF to 13.9% during the Tenth plan (2002-07) and to 18.7 % during the first three years of the Eleventh Plan. Though the GCF (agri) as a percentage of agri-GDP has more than doubled during the last decade, the agri-GDP growth has not accelerated commensurately.

In case of public investments in agriculture, more than 80% is accounted for by major and medium irrigation schemes. Even in the case of private investments in agriculture, almost half is accounted for by irrigation (minor, primarily through groundwater, but also now increasingly by micro-irrigation etc.). So irrigation remains the most dominant component in the overall investment in agriculture. Without proper use of water, it is difficult to get good returns on better high yielding seeds and higher doses of fertilizers. Water will remain a critical input for agriculture in the decades to come until science develops seeds that can thrive in arid and semi-arid areas with very little water.

India currently has an irrigation potential of 140 million ha, out of which only about 109 million ha have been created. However, there are wide variations in irrigation coverage across states and across crops. While Punjab (98), Haryana (85), Uttar Pradesh (76), Bihar (61), Tamil Nadu (58) and West Bengal (56) have more than half of the cropped area under irrigation; Odisha, Rajasthan, Madhya Pradesh, Karnataka, Chhattisgarh, Himachal Pradesh, Maharashtra, Kerala, Jharkhand and Assam have very low acreage under irrigation. Groundwater irrigation, which is the main source of irrigation, suffers from over-exploitation in most of the states, particularly in north-west India where the water table is depleting drastically.

Inefficient water use in irrigation is also leading to environmental degradation via waterlogging and induced salinity. The irrigation efficiency in the systems needs to be upgraded from the present level of 35 % to about 60 % in the surface water system and from 65 % to 75 % in the groundwater system. Even a rise of 5 % in irrigation efficiency can increase the irrigation potential by 10-15 million ha. Despite wide promotion, micro-irrigation technologies currently cover only about 0.5 million ha (NAAS 2009).

The net sown area in India has remained around 141 million hectares during the last 40 years. About 58% of the net sown area in India is rain-fed which contributes about 44% to the total production of foodgrains. The criticality of rain-fed agriculture to India is highlighted by estimates that it supports an estimated 40% of population (484 million) and a large share of cropped area under rice (42%), pulses (77%), oilseeds (66%) and coarse cereals (85%). The growth of crops and the food production of the country are strongly influenced by the total rainfall as evident from the positive and significant correlation coefficient of + 0.78** (1999-2010). (Source: CRIDA)

1.2 Support Infrastructure for Agriculture[2]

Research and Extension System in Agriculture: India's National Agricultural Research System is spearheaded by the Indian Council of Agricultural Research (ICAR) of the Ministry of Agriculture.

2 This section and the associated Annexure 1 draws significantly from Chapter 6 titled Agricultural Research, Education and Extension of the review document 'State of Indian Agriculture 2011-12' prepared by the Ministry of Agriculture & Cooperation, Government of India

Weblink: http://agricoop.nic.in/SIA111213312.pdf accessed on 17August 2012

Through its network of research institutions spread across India and the State Agricultural Universities (SAUs), ICAR forms the core of the public sector agricultural R&D organizations in India. The major contributions of the agricultural R&D system in the last ten years include BT cotton, hybrid maize and Pusa basmati. Currently, India has a network of 53 State Agricultural Universities (SAUs), one Central Agricultural University (CAU), five Institutes having Deemed-to-be-Universities (DUs) status and four Central Universities (CUs) with Agriculture faculty. With about 265 constituent colleges having a 35,000 student-intake capacity, the AUs impart education in 11 major disciplines at the undergraduate and in about 95 subjects at the post-graduate level.

The endeavours of extension or transfer of technology has been a mix of field extension carried out by line departments of the states, backstopped by frontline extension systems of ICAR Institutes and SAUs, Commodity Boards, non-government organisation (NGOs) and voluntary organizations. Public extension services can be deemed to be very weak in India, particularly, for addressing the emerging technological and knowledge needs. Efforts have been made to strengthen the system with some new and innovative schemes, such as establishing and operating *KrishiVigyanKendras* (Agriculture Science Centres). The Scheme is currently in operation in 603 districts of 28 States & 3 Union Territories. The scheme, essentially, focuses on institutionalizing key agricultural technological interventions to enable breakthroughs in agriculture production and profitability in rural communities.

A few salient initiatives by the state for improving the knowledge, training, extension, and research and development (R&D) infrastructure for agriculture are provided in Annexure 1.

Agricultural Statistics: Timely availability of reliable information on agricultural output and other related aspects is of great significance for planning and policy formulation particularly in the context of food security, price stability, international trade, etc. To meet these requirements, the Directorate of Economics and Statistics (DES), Department of Agriculture & Cooperation releases estimates of area, production and yield of principal crops of food grains, oilseeds, sugarcane, and fibre crops. Estimates of crop production are obtained by multiplication of area estimates by corresponding yield estimates. Generally, four advance estimates and one final estimate of area, production and yield are released during each agricultural crop year (July to June).

For more details about estimation procedures for crop production, please refer Annexure 1.

1.3 Changing Rural and Agricultural Livelihoods

With the declining share of agriculture to GDP, the continuing high pressure of population on agriculture and the increasing fragmentation of land holdings leading to decreasing availability of cultivated land area per household, the agriculture sector alone would hardly be in a position to create additional employment opportunities to sustain the livelihood of the rural households. This calls for creation of additional employment opportunities in the services and manufacturing sector.

The role of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in arresting the potential distress from unemployment and disguised employment in the agricultural sector cannot be overemphasized. Moreover, it has given a new fillip to the wages of rural workers particularly the small and marginal farm ers in the poorest areas of the country. MGNREGA is a landmark legislation aimed at strengthening livelihood security for the rural poor by guaranteeing hundred days of wage employment in a financial year, to a rural household whose adult members volunteer to do unskilled manual work. It has generated more employment for the rural poor than any other program in the history of independent India. In 2010-11, nearly 53.5 million families were provided over 2.25 billion person-days of work under the programme. Over the last five years, MGNREGA has generated more than 7.5 billion person-days of work at a total expenditure of over INR 1,400 billion. The share of SC/ST families in the work provided under MGNREGA has been 40% and 53% of workers are women. Average wages of workers have gone up by 54 per cent over the last five years and wages have now been so indexed that workers will be protected from the ravages of inflation (Planning Commission; Rural Development Division, 2012).

Structural change in the composition of the agriculture sector has led to a worthwhile diversification of Indian agriculture into horticulture, livestock and fisheries since the 1990s. The share of livestock in total output from the agriculture and allied sectors

has increased from 20% in Triennium Ending (T.E.) 1990-91 to 25% in T.E. 2009-10 (at 2004-05 prices). Currently foodgrains constitute about one fifth of the total value of output from the agriculture & allied sector which is less than the contribution from the livestock sector and almost equal to that of the horticulture sector (Ministry of Agriculture & Cooperation, 2012).

The shares of fruits & vegetables and livestock have shown an increasing trend in recent years implying that they have been growing at a much faster rate than the traditional crops sector. Given the rising share of high value commodities in the total value of agricultural output and their growth potential, this segment is likely to drive agricultural growth in the years to come.

National Rural Livelihoods Mission (NRLM) is an emerging flagship programme for the rural livelihoods sector that seeks to overcome rural poverty in a sustainable manner. NRLM is a restructured version of a social scheme of the Ministry of Rural Development (MoRD) named the Swarnajayanti Gram SwarojgarYojana (SGSY) that focused on self-employment in rural areas. After agreeing upon the framework for implementation of NRLM inDecember 2010, GoIllaunched the same on 3 June 2011, to be implemented in a mission modeacross the country.

1.4 Key Risks in Indian Agriculture and Coping Strategies[3]

Yield risk becomes the most important agricultural risk in India given the fact that crop losses arising from production shortfalls or complete crop output failure wipe out farm profits and trigger a condition of distress. Such condition frequently lead to erosion of cultivation costs triggering a high probability of defaults by indebted farmers or inducing asset-depletion and poor investment in future agricultural seasons. For a monsoon dependent agricultural economy like India unmitigated yield risks become even more pronounced as it can be generalized that around sixty percent of the variation in crop yield is induced by fluctuations in critical weather parameters like rainfall (Jodha 1972, 1978, 1981a, 1981b; Anderson and Hazell 1989, Walker and Ryan 1990, Hardaker et al 1994). According to a more recent finding by CRIDA – India's premier research institute for research in dryland agriculture, the growth of crops and the food production of the country are strongly influenced by the total rainfall as evident from the positive and significant correlation coefficient of + 0.78** (1999-2010).

Given the exposure of crop yields to a multitude of perils[4], it becomes imperative to design risk management systems to stabilize crop incomes by attenuating seasonal and inter-annual variability. It may be noted that the preponderant small and marginal farmers are naturally the most vulnerable groups as they have a low asset base, are resource poor and predominantly operate under rainfed conditions. With low investment potential and poor coping ability these households are the greatest risk of falling into debt and poverty traps in the eventuality of adverse weather shocks. The vulnerability of resource poor farmers and landless agricultural labourers is aggravated by the multitude of uninsured risks in conditions where the full-insurance opportunities are absent (Moscardi and De Janvry 1977, Feder 1980, Rosenzweig 1988, Walker and Ryan 1990, Townsend 1994, Ravallion and Chaudhuri 1997, Kurosaki 1998).

Farmers in India have been observed to be risk-averse and that they seek to avoid risk through various managerial and institutional mechanisms (Binswanger, 1980 and Hazell, 1982). Studies have shown the limitations and adverse consequences of consumption and income smoothing by risk-averse poor households (Rosenzweig and Wolpin 1985, Deaton 1992, Paxson 1992, Rosenzweig and Binswanger 1993, Morduch 1995). Traditional coping mechanisms and adaptation strategies like drought proofing by mixed cropping, changing varieties, crops and sowing time, matching crop phenology with weather and water availability and diversifying income sources are not always efficient and effective against aggregate climatic shocks and disasters. Such traditional risk management systems are sub-optimal and informal risk management strategies are inefficient as they fail to protect the households in the eventuality of covariate adverse shocks and catastrophic idiosyncratic shocks. Agricultural shocks are further amplified in rural areas where financial markets are incomplete and the imperfect land, labour and credit markets

3 This section draws significantly from Chapter 1: Agricultural Risk Management of the report on 'Evaluation Study of Pilot Weather Based Crop Insurance Scheme' commissioned by the Ministry of Agriculture & Cooperation, Government of India in 2010 Weblink: http://www.afcindia.org.in/PDF/research_reports/WBCIS-FINAL%20REPORT-060211-PDF%20TO%20AFC/WBCIS-FINAL%20REPORT-060211.pdf accessed on 17 August 2012

4 Inter-temporal and spatial vagaries in the quantum and distribution of rainfall which assume significance in inducing yield uncertainty.

Table 1: Strategies of Farmers for Managing Agricultural Risks

		Informal Mechanisms	Formal Mechanisms	
			Market based	Publicly provided
Ex-Ante Strategies	On-farm	• Crop diversification • Inter-cropping & Mixed-cropping • Staggered planting • Mixed farming • Buffer stock accumulation of crops or liquid assets • Adoption of advanced cropping techniques (fertilization, irrigation, resistant varieties)		• Agricultural extension • Supply of quality seeds, inputs, etc • Integrated pest management • Infrastructures (roads, dams, irrigation system) • Weather advisories
	Sharing risk with others	• Crop sharing • Sharing of agricultural equipment, irrigation sources, etc • Informal risk pool	• Contract farming/direct marketing • Futures contracts	
Ex-Post Strategies	Coping with shocks	• Reduced consumption patterns • Deferred / low key social & family functions • Sale of assets • Migration • Mutual aid / borrowing among relatives, affinity groups	• Consumption Credit	• Social assistance (calamity relief, food-for-work, etc) • Rescheduling / waiver of loans • Agricultural insurance • Simplified / relaxed procedures of grain procurement • Supply of fodder • Cash payment

Source: Rao, K.N. (2008) 'Risk Management of Small Farms in India', Unpublished Report from Consultancy Work for Food and Agriculture Organization of the United Nations

are inter-locked. These preconditions dictate the need for formal risk transfer mechanisms like insurance in Indian agriculture and crop insurance has evolved as one of the most important means of indemnifying the losses in crop yields, and hence crop incomes.

1.5 Core Problems for Sustainable Rural and Agricultural Livelihoods

High vulnerability of farmers to exogenous risks leading to recurrent underinvestment in agriculture

Agriculture in India is labelled as 'a Gamble on the Monsoons', which signifies its high vulnerability to exogenous risks. These exogenous risks get amplified in the presence of structural constraints (low emphasis on mechanization due to ample labour availability, poor investment in agricultural infrastructure by state etc.) and systemic risks (poor quality of soils, climate conducive to pestilence etc.) leading an increased tendency for risk aversion among small and marginal farmers. This manifests usually in the form of sub-optimal investments in agriculture which perpetuates a vicious cycle of poor returns and sub-optimal investments. The success of BT cotton in India is a shining example of how the mitigation of an exogenous/systemic risk can lead to a turnaround in the agricultural fortunes of a crop economy.

Inadequate agricultural infrastructure and its sub-optimal distribution/location

The lack of agri-infrastructure demands the highest attention from the state as it not only impacts the performance of the entire agricultural value chain

but it disproportionately limits the economic growth opportunities for smaller and disadvantaged economic actors (especially marginal and small farmers). Of late there has been a strong impetus on improvement of agri-infrastructure for processing and value-addition as it is perceived as a natural growth lever for income enhancement in agriculture. However the lack of a coherent strategy for development of agri-infrastructure is bound to increase the economic disparity between small farmers, large farmers and supply chain intermediaries on account of their differential ability to access and exploit such infrastructure.

Weak institutional structure resulting in a large disconnect between policy and implementation

It is widely believed that the India which exists on paper is starkly different from what is seen in reality. Such a conception, though unfortunately true, is an outcome of the weak institutional structure in India that severely undermines the ability to reap any significant dividends from a thoughtful policy, strategy or plan. Furthermore, the complex bureaucratic system entrusted with the design and execution of policy has been seen to be plagued by perceptual biases, and a distorted view of ground realities. Evidences to support the previous argument abound: for instance trading of future contracts for agricultural commodities was allowed on commodity exchanges with a view to enable farmers to hedge their price risks. More than seven years after their introduction, there are only a handful of incidences of hedging by farmers through such instruments. Without the participation of farmers, the daily turnover from trading on agri-commodity futures exceeds INR 100 billion. The zeal of the Government agencies (during 2007-10) in promoting bio-fuels, particularly jatropha, has largely faded away. Though documentation and paper reports may reflect otherwise, an overwhelming majority of initiatives and programs of the state fail to deliver significant value to the targeted beneficiaries.

Substandard capture/collection, recording and retrieval systems for agricultural data

Even though there are multiple entities contributing towards capture/collection and organization of data in agriculture, the quality of data related to the agricultural sector in India is below-par. Starting with the estimation of generic data such as crop area, yields, prices etc. to more specific data like location and severity of losses, intensity of loss agent, quantity traded within a price band, price for a given quality of produce etc.; the reliability, verifiability and resolution of the data is grossly inadequate which culminates in poor design of policies, interventions and evaluations.

Low differentiation and poor quality control in agricultural produce

One of the main reasons why farmers fetch lower prices for their goods which are subsequently sold at significantly higher prices by traders is the lack of quality control and poor differentiation of their product/produce. Undifferentiated and low quality produce preclude farmers from charging a premium for their output. Despite having clear definitions/specifications of quality for agricultural produce, farmers still continue to be underpaid by traders/intermediaries on the pretext of lower quality than what is supposed by the producer himself. As a result of their aversion or inability for value addition and quality control, farmers are unable to capitalize on the premiums which consumers today are willing for products backed by proven claims of natural/eco-friendly processes, Fair Trade or other social mandate(s).

Distorted markets for agricultural labour leading to reduced profitability

The massive rural employment programme under MGNREGA has curtailed distress migration from some of the poorest areas of India. This has resulted in distortion of labour supply and wages particularly in states where migrant labour used to be the mainstay of agricultural operations. Mechanization of agriculture has gained impetus in such regions but on account of the low potential for capital investment among the small and medium farmers, they are likely to witness reduced profitability in the short to medium term due to higher labour costs.

2. Agricultural Insurance

2.1 Foundations of Agricultural Insurance in India[5]

In India, J S Chakravarti[6] designed, as early as in 1920, a scheme of agricultural insurance based on rainfall for India which is a path breaking work in the space of agriculture insurance. His approach has an all-India perspective, though data relating to the then Mysore state (in Karnataka now) were used for the purpose of giving the scheme a concrete shape and for analyzing its operational and financial implications. Chakravarti'sinsightful model is an innovative application of the fundamental principles of insurance to the subject of agricultural insurance.

The detailed scheme of agricultural insurance laid down by Chakravarti was sensitive to the issues of basis of insurance. His preference was for value rather than quantity as the basis of insurance given the inverse relationship between quantity and price of produce and eventualities in bad crop seasons. He took due consideration of the indemnification level, role of the state within an 'area approach' analogous to Dandekar's (1976) homogenous area approach. He emphasized the problems of moral hazard in crop insurance and suggested a scheme of drought insurance.

As per his model, ifthe aggregate rainfall from the beginning of the agricultural year as measured at the rain-gauge at the taluka headquarters up to a certain date is less than a certain amount, then a certain sum of money will be paid in respect of the insured field as compensation. The above contract has three critical elements: a specified date, a specified degree of deficiency in rainfall and a prescribed amount of compensation. More information about Chakravarti model can be found in Annexure 2.

It may be noted that this scheme is very similar to that suggested in World Bank (1992). Its architecture is based on empirical data and the details lay sound foundations for designing insurance schemes in agriculture. The World Bank scheme aims to cover all rural households by selling insurance in the form of 'rainfall lotteries' while Chakravarti's scheme favoured coverage of only crop producers. The monumental framework for agricultural insurance suggested by Chakravarti has definitely not received the visibility it deserves.

From the perspective of state policy in India, the question of introduction of a crop insurance scheme was taken up for examination soon after the Indian independence in 1947. Following an assurance given in this regard by the Ministry of Food and Agriculture in the Central Legislature to introduce crop and cattle insurance in the country, a special study was commissioned in 1947-48.

The fundamental aspect regarding the modalities of crop insurance considered was whether the same should be on an 'individual approach' or on a 'homogenous area' approach. The former seeks to indemnify the farmer to the full extent of the losses and the premium to be paid by him is determined with reference to his own past yield and loss experience. The 'individual approach' basis

5 This section draws substantially from the Chapter 1 Agricultural Risk Management of the report on 'Evaluation Study of Pilot Weather Based Crop Insurance Scheme' commissioned by the Ministry of Agriculture & Cooperation, Government of India in 2010

Weblink:http://www.afcindia.org.in/PDF/research_reports/WBCIS-FINAL%20REPORT-060211-PDF%20TO%20AFC/WBCIS-FINAL%20REPORT-060211.pdf accessed on 17 August 2012

6 The scheme is outlined and discussed in his book 'Agricultural Insurance: A Practical Scheme Suited to Indian Conditions' published in 1920', printed at the Government Press, Bangalore. In 1920 he already had eleven years' experience with the Mysore State Life insurance Scheme - first as secretary and then as president of the State Insurance Committee; see Mishra (1995)

necessitates reliable and accurate data of crop yields of individual farmers for a sufficiently long period, for fixation of premium on actuarially sound basis. The 'homogenous area' approach envisages that in the absence of reliable data of individual farmers and in view of the moral hazards involved in the 'individual approach', a homogenous area comprising villages that are homogenous from the point of view of crop production and whose annual variability of crop production would be similar, would form the basic unit, instead of an individual farmer.

The study reported in favour of a 'homogenous area' approach even as various agro-climatically homogenous areas treated as a single unit and the individual farmers in such cases pay the same rate of premium and receive the same benefits, irrespective of their individual fortunes. The Ministry of Agriculture circulated the scheme, for adoption by the State governments, but the States did not accept.

In 1965, the Government of India (GoI) introduced a Crop Insurance Bill and circulated a model scheme of crop insurance on compulsory basis to constituent State governments for their views. The bill provided for the Central Government framing a reinsurance scheme to cover indemnity obligations of the States. However, none of the States was in favour of the scheme because of very high financial obligations. On receiving the reactions of the State governments, the subject was considered in detail by an Expert Committee headed by the then Chairman, Agricultural Price Commission in July, 1970 for full examination of the economic, administrative, financial and actuarial implications of the subject.

2.2 Crop Insurance Program in India: From 1972 to the First Pilot of Weather Index Insurance in 2003

The major initiatives in the domain of crop insurance in India during the three decades from 1972-73 to 2002-03 are discussed below.

Table 2: Major Initiatives in Crop Insurance (1972 to 1999)[7]

Scheme (Duration)	Background and Salient Features	Key Statistics
Program based on 'Individual' approach (1972-78)	• Experiments on crop insurance on a limited, ad-hoc and scattered scale • In 1972-73, the General Insurance Department of Life Insurance Corporation of India introduced a Crop Insurance Scheme for H-4 cotton • Based on "Individual Approach" & later included new crops such as Groundnut, Potato etc. and new states • In 1972, general insurance business was nationalized and, by an Act of Parliament, the General Insurance Corporation of India (GIC) was set up	• Farmers Insured: 3,110 • Premiums: INR 454 thousand • Claims: INR 3.79 million
Pilot Crop Insurance Scheme (PCIS) (1979-84)	• Based on the above experiments, GIC entrusted a study to eminent agricultural economist, Prof. V.M. Dandekar • According to the recommendations of Prof. Dandekar, PCIS was introduced by GIC from 1979 • PCIS was based on homogenous 'Area' approach • Coverage restricted to loanee farmers and on a voluntary basis. Maximum sum insured was 100% of the crop loan, which was later increased to 150% • Risk shared between GIC and State Governments in the ratio of 2:1 • 50% subsidy towards premiums for Small / Marginal farmers, contributed by State Governments &GoI on 50:50 basis	• Crops Insured: Cereals, Millets, Oilseeds, Cotton, Potato and Gram • Coverage: 13 States • Farmers Insured: 627 thousand • Premiums: INR 19.7 million • Claims: INR 15.71 million

7 Adapted from the Chapter 1 Agricultural Risk Management of the report on 'Evaluation Study of Pilot Weather Based Crop Insurance Scheme' commissioned by the Ministry of Agriculture & Cooperation, Government of India in 2010

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Comprehensive Crop Insurance Scheme (CCIS) (1985-99)	• CCIS was an expansion of PCIS • Coverage was made compulsory for farmers availing crop loans for growing food crops & oilseeds • Maximum sum insured was restricted to 100% of crop loan subject to an upper limit of INR 10,000 per farmer, which was later increased to 150% • Premium rates were 2 percent of the sum insured for cereals & millets and 1 percent for pulses & oilseeds	• Coverage: 16 States & 2 UTs • Farmers Insured: 76.3 million • Premiums: INR 4035.6 million • Claims: INR 23190 million
	• 50% of the premium for Small/Marginal farmers was subsidized equally by Central and State Governments • Premium and claims shared between the Centre & States in 2:1 ratio • CCIS was a multi-agency effort, involving GoI, State Governments, Banking Institutions and GIC	

The Comprehensive Crop Insurance Scheme was implemented for 15 years, from Kharif 1985 to Kharif 1999. In its review of CCIS, *Background Note on Crop Insurance* - a Publication of Ministry of Agriculture and Cooperation (GoI), stated that:

The Scheme had a positive and stabilizing influence on agricultural production and productivity in respect of crops insured and is a popular program particularly in those areas of certain States where the risk factor in agriculture is relatively higher. This "positive" and "stabilizing" influence came at a large cost. The claims percentage (percentage of claims to premiums) was 572%. The loss between premiums paid and insurance claims amounted to 184,446 lakhs, exclusive of administrative costs (five to seven percent typically). Only four of the 22 participating states had insurance charges greater than claims. The CCIS only charged premiums of 1-2% percent, while claims made were approximately 9% of the sum insured.

National Agricultural Insurance Scheme – NAIS (1999 onwards): National Agricultural Insurance Scheme (NAIS) is the flagship crop insurance scheme currently being implemented in India. It was introduced in Rabi 1999-2000 seasonby improving the scope and content of the erstwhile CCIS.

As expressed by the Ministry of Agriculture and Cooperation (GoI) in its publications, an 'individual' crop insurance scheme is not possible in India for several reasons, including "prohibitive costs due to huge requirement of men and material" and "disputes over fixing guaranteed yield and loss assessment." Consequently NAIS is being operated under an indexed approach known as the area yield-based approach, much like its predecessor CCIS. Using the area yield-based approach has other merits. Most importantly, it mitigates moral hazards and adverse selection.

Under the area-yield based approach, the index used is the crop yield of a defined area called an insurance unit (IU, e.g., an administrative unit in India such as block/hobli/mandal/patwarihalka etc.). The actual yield of the insured crop, measured by crop-cutting experiments in the IU, is compared to historical yields. If the former is lower than the latter, all insured farmers in the IU are eligible for the same rate of indemnity payout. The value of the historical yield (also referred to as the threshold yield) for each crop grown in an IU is based upon a moving average of the actual yields realized over the past five years.

The key design and administration aspects of NAIS are summarized below. For key operational aspects, please refer to Annexure 3.

(i) **States and Areas covered:** The scheme is available to all states and Union Territories, on an optional basis. A state opting for the scheme will have to continue it for a minimum period of three years.

(ii) **Farmers covered:** All farmers including sharecroppers and tenant farmers, growing the notified crops in the notified areas, are eligible for coverage. The scheme is compulsory, for farmers availing crop production loans (borrowing farmers) and voluntary for others (non-borrowing farmers).

(iii) **Crops covered:** *The Scheme covers*

a) Food crops (Cereals, Millets & Pulses)

b) Oilseeds (groundnut, soybean, sunflower, rape seed& mustard, safflower, niger etc.)

c) Annual Commercial / Horticultural crops - sugarcane, cotton, potato, onion, chilly, turmeric, ginger, jute, tapioca, coriander, cumin, isabgol, fennel, fenugreek, annual banana, annual pineapple, etc.

(iv) **Sum insured:** The minimum Sum Insured (SI) in case of borrowing farmers, is the amount of loan availed, which can be further extended up to 150% of the average yield. For non-borrowing farmers, it can be up to a value of 150% of the average yield.

(v) **Premium rates:** The premium rates are 3.5 percent for oilseeds & pearl millet and 2.5 percent for cereals, millets & pulses, during Kharif (June – October); in the Rabi season (November – March), the rates are1.5 percent for wheat & 2 percent for other food crops and oilseeds. The rates for annual commercial / horticultural crops are **actuarial.**

(vi) **Premium subsidy:** Small / Marginal farmers are subsidized in premium to the extent of 50 percent, to be shared equally between the Central government & the participating States. It is retained at 10 percent since 2004-05.

(vii) **Scheme approach:** The scheme covers losses from **sowing to harvesting**, and operates on an 'area yield' basis for **widespread calamities**. For this purpose, a unit of insurance (IU), is defined. It may be a Village Panchayat, Mandal, Hobli, Circle, Phirka, Block, Taluka, etc., to be decided by the state. However, each participating state was required to reach the level of Village Panchayat as the unit, within a maximum period of three years. The scheme is to operate on **'individual plot'** basis for specified **localized calamities**. However, individual assessment of losses is currently piloted only in a few areas within each participating state.

(viii) **Loss assessment, Levels of Indemnity & Threshold Yield:** The Threshold Yield (TY), also called Guaranteed Yield for a crop in an IU, shall be the moving average yield based on the past three years, in case of Rice & Wheat, and five years for other crops, multiplied by the level of indemnity. Three pre-defined levels of Indemnity (coverage levels), viz., 90%, 80% and 60%, corresponding to Low Risk, Medium Risk & High Risk areas, will be available for all crops. The insured farmers of a unit area may also opt for higher level of indemnity, on payment of an additional premium.

If the 'Actual Yield' (AY) per hectare of the insured crop for the IU falls short of the specified 'Threshold Yield' (TY), all the insured farmers growing that crop in the IU, are deemed to have suffered a shortfall in their yield and are paid indemnity per formula given below:

$$Indemnity = \text{Max}\left(0, \frac{Threshold\ Yield - Actual\ Yield}{Threshold\ Yield}\right) \times Sum\ Insured$$

(ix) **Sharing of Risk:** Until transition is made to an actuarial regime, Central government and states shall share claims beyond 100 percent of the premium collected, for food crops & oilseeds, on 50:50 basis. In case of annual commercial / horticultural crops, claims beyond 150 percent of premium in the first 3 or 5 years, and 200 percent thereafter, are borne by the Central government and State on an equal (50:50) basis.

There have been huge gaps in coverage of farmers and crops under NAIS which is a multi-peril, area based crop insurance scheme that is mandatory for loanee farmers. By limiting the premiums to be paid by farmers to a small fraction of the actuarial premiums, the area yield based crop insurance under NAIS is akin to a welfare scheme of the Indian government. During its operation so far, this scheme has been beset with multiple problems: the primary ones include the accentuation of regional disparities (in terms of farmers covered, premium collected, and claims settled), financial strain on the public exchequer and administrative difficulties for implementing agencies, amid the lack of endorsement or interest from farmers. The perceived lack of reliability and transparency associated with CCEs (crop cutting experiments) for area yield estimation and low investments in sensitization of farmers for their

active participation has led to a schism between state agencies and farmers on the issue of crop insurance.

2.3 Advent of Weather Index Insurance in India and its Evolution

At almost the same time when AIC was being hived off from the behemoth General Insurance Company of India, a financial innovation 'weather index insurance' was coming to the fore. This instrument which was piloted successfully for the first time in India and the developing world in 2003 promised to overcome the problems with the traditional area yield based crop insurance. It seemed to address the problems of moral hazard, adverse selection, low transparency, high administrative costs and inadequate indemnification levels. In addition, it brought in a paradigm shift by reducing the high turnaround times and poor servicing and claims management of the traditional crop insurance products (Manuamorn 2007). The first weather index insurance in India was a rainfall insurance contract underwritten in 2003 by ICICI-Lombard General Insurance Company for groundnut and castor farmers of BASIX's water user associations in Mahabubnagar district of Andhra Pradesh.

Weather index insurance products are contingent claims contracts for which payouts are determined by an objective weather parameter or a combination thereof (such as rainfall, temperature, humidity etc.) that is highly correlated with farm level yields or revenue outcomes. The underlying premise of weather insurance is that weather parameters can be reliable proxy indicators for the actual losses incurred by farmers. In addition, the weather index must satisfy a number of additional properties that affect the degree of confidence or trust that market participants have in that index; some of these properties are accuracy, reliability, and low susceptibility to measurement errors. Because claims for indexed contracts are automatically triggered once the weather parameter reaches a pre-specified level, the insured farmers receive timely payouts. The automatic trigger reduces administrative costs for the insurer by eliminating the need for unwieldy field-level damage assessment i.e. the field crop cutting experiments (CCEs).

Since weather data - the bedrock of weather index is a transparent, objective, and public statistic, possibilities of frauds and moral hazard are minimal. Weather index insurance facilitates risk transfer to international markets through reinsurance which is more easily available for verifiable and transparent indices of loss assessment like weather index. Considering the limitations of weather insurance, it should be borne in mind that weather insurance alternatives provide only partial cover to farmers by protecting them against specific crops perils directly attributable to weather parameters. Another limitation could be lack of correspondence between weather parameters recorded at the designated weather station and crop yield income outcomes of the insured farmers. This lack of correspondence, technically denoted as basis risk, in the specific case of rainfall, is responsible for divergence between the economic outcomes (revenue/production) based on precipitation measured at the weather station and the corresponding economic outcomes actually realized on the insured farm. Basis risk in weather index-based insurance is not only inherent in the location of reference weather station but is also a function of the design of the weather index.

In view of the problems faced by crop insurance schemes in many countries, alternative risk transfer instruments like rainfall insurance have received attention (Anderson et al 1989, Walker et al 1990, World Bank 1992, Manuamorn 2007). Rainfall insurance, i.e. insurance against both deficit and excess rainfall, and drought insurance, i.e. insurance against prolonged rain deficiency only have become two of the most popular alternatives to traditional crop insurance.

Functional Designs of Weather Index Insurance Products Employed in India[8]

Total Seasonal Rainfall Index [Kharif 2005 (AIC)]
Chakravarti (1920) envisaged a rainfall insurance

8 This section extracts and draws substantially from Clarke, Mahul, Rao & Verma. (2012). Weather Based Crop Insurance in India. Policy Research Working Paper – 5985. The World Bank : Financial and Private Sector Development Vice Presidency, Non-Banking Financial Institutions Unit & South Asia Region: Finance and Private Sector Development Unit

http://elibrary.worldbank.org/docserver/download/5985.pdf?expires=1361453683&id=id&accname=guest&checksum=6894452FE5C3FF8E30D68D7B636078F2 accessed on 17 August 2012

product in which claim payments would be due if the total rainfall during a season was less than a given threshold (Mishra 1995). More generally, the claim payment from a total seasonal rainfall indexed insurance product is typically a step function of the total rainfall in a given season. For such products, total rainfall is often expressed as a fraction of normal rainfall, calculated to be the historical average rainfall.

Although sold by AIC in 125 locations over 10 states in Kharif 2005, rainfall indices based on total seasonal rainfall quickly fell out of favour due to the following limitations. First, such indices ignore the significance of rainfall distribution and focus solely on the total rainfall received during the crop season. A significant number of incidences of large-scale crop losses in India have been the result of long dry spells, and these may not be reflected in total rainfall. Second, by assuming that only average rainfall affects crop yields, the approach disregards both the phenological stages of crop growth and the observation that any rainfall beyond the field capacity of the soil is redundant for crop growth.

Weighted Rainfall Index[Kharif 2003 (ICICI Lombard); Kharif 2004 (AIC & IFFCO Tokio); Kharif 2005 (AIC & IFFCO Tokio)]

For its first pilot, the contract structure was drawn around the historical value of the average rainfall for the location of interest. Daily rainfall was aggregated at a weekly or 10-day (dekad) frequency, broadly in line with the definition of Standard Meteorological Weeks (SMW) or Standard Meteorological Dekads (SMD). Usage of homogenous rainfall periods was aimed at making rainfall-based crop insurance contract simple to understand for farmers while retaining the ability to capture adverse events related to rainfall volume and distribution.

The dependence of key crop stages on the distribution of rainfall was incorporated in the weather-based crop insurance contract through the use of a weighing factor which signified the importance of rainfall during a given SMW/SMD. Critical periods (SMW/SMD) of rainfall requirement attracted higher weights vis-à-vis their less significant counterparts (from perspective of rainfall). The individual weights were determined from crop-water requirements (as advised by local experts in agro-meteorology) that maximized correlation between historical crop yields and the historical rainfall index. Historical crop yields for a given location were usually derived from the crop production estimates of the Government, arrived with the help of Crop Cutting Experiments (CCEs) conducted at the designated insurance unit level. An alternative approach for determining individual weights for rainfall periods (SMW/SMD) involved the usage of crop calendars developed by eminent technical institutions like IMD and IARI, which enabled the specialists structuring weather insurance to assess the specific rainfall requirement for various periods.

The typical structure of a weighted rainfall index is of the type

$$R_t = \sum_{i=1}^{m} \omega_i r_{it}$$

Where m is the total number of dekads or weeks in the growing season, ω_i is the weight assigned to the period i of the growing season and r_{it} is the effective rainfall in the period i of year t. The weights ω_i are chosen to maximize the sample correlation.

The reference or benchmark rainfall index which serve as the strike/trigger values for the rainfall-based crop insurance contract, represent fair rainfall conditions under which a farmer can be expected to obtain satisfactory yields from the cultivated crop. This value is fixed after reviewing the historical rainfall index distribution, desired premium levels, risk coverage demands of growers, technical input from agro-meteorological experts and crop calendars etc.

The weighted rainfall index has the inherent advantage of integrating both the rainfall aspects within a single index. Despite its conceptual appeal, the weighted rainfall index suffers from the following limitations that have restricted its application for weather insurance in India:

First, weights for different rainfall periods under the weather insurance cover were fixed mainly through statistical optimization techniques. The major objective of these techniques was to either maximize the correlation between rainfall index and area yields or to minimize the coefficient of variation (CV) of farmer-level crop revenue per unit area. As a result of singular focus on statistical optimization, the weights for weighted rainfall index got delinked from empiri-

cal observations. Farmers and insurance facilitators (mostly NGOs and CBOs) found it difficult to assess the scientific validity of weights which could differ widely for the same crop in neighboring locations.

Second, weighted rainfall index provided scope for cross-subsidization across different rainfall periods. For example, large volume of rainfall in a period of low significance (weight) could have anomalously compensated for poor rainfall in a period of high significance (weight).

Multiple Phase Rainfall Index [Kharif 2004 (ICICI Lombard); Kharif 2008 onwards (ICICI Lombard, AIC, IFFCO-Tokio and Other Insurers]

In response to the farmer feedback collected after the first pilot, ICICI Lombard came up with a phase-wise rainfall index for Kharif 2004 season. Under this rainfall cover, the Kharif growing season is divided into sequential phases of varying duration, each having its specific minimum rainfall requirements for crop sustenance. These phases model the crop-growth stages as defined by crop calendars and other reference sources for agronomy. For each of the phases covered under the deficient rainfall peril, a particular threshold or 'strike' value is derived based on scientific inputs and weather insurance simulations. Payments are triggered if the total rainfall in the phase rpis below the rainfall trigger, linearly increasing to the maximum payment of Ratep x (Triggerp – Exitp) forrp ≥ Exitp. Such a schedule would lead to a claim payment as follows:

$$= \sum_{p \in \{phases\}} Rate_p \; x \; max\,[0,\; Trigger_p - max(r_p,\; Exit_p)]$$

The phase-wise rainfall index has left an indelible mark on the Indian weather insurance landscape. Owing to its simplicity and direct correspondence with ground-level understanding, it has been regularly favored by different categories of stakeholders including insurers, farmers and insurance facilitators. This design provides clarity to the potential subscribers by clearly associating each critical crop-growth phase with a distinct rainfall insurance structure.

The key strengths of phase-wise rainfall index insurance are:

- It is able to factor in differences in weather requirements during various crop phases while obviating need of weights. Weather requirements for different crop phases can be modulated throughthe maximum sum assured for the phases.
- Phase-wise rainfall insurance provides scope for interim payouts instead of having to wait till completion of policy period.
- While it provides farmers/clients greater flexibility in choosing their risk retention and risk transfer, it benefits insurers by allowing them to increase their business volume by having a longer sales period.

Despite its underlying advantages and stakeholder support, the phase-wise rainfall index suffers from the following key weaknesses which underline the need for further refinement in index designs:

- Phase-wise rainfall insurance index leaves scope for long dry spells which can easily go unnoticed with this design. Such a possibility becomes increasingly tangible for phases with durations exceeding a fortnight (15 days). The distribution aspect of rainfall is compromised greatly in the phase-wise rainfall insurance products.
- Phase-wise rainfall insurance discounts the rainfall in the preceding phases and thus makes the crop productivity (yield) under a particular phase independent of the crop health and rainfall in the previous phase(s). At the beginning of each phase, the crop is assumed to be ready for a normal productivity (yield) which is tempered by rainfall conditions during that phase. A paradigm of this kind is a departure from reality and can lead to paradoxical situations wherein a farmer is paid claims for losses in a later phase despite having lost the crop completely (breaching the 'exit') during an earlier phase.

Consecutive Dry Days Index [Kharif 2008 onwards (ICICI Lombard, AIC, IFFCO-Tokio and Other Insurers]

Another approach to capturing adverse rainfall events is to construct an index equal to the maximum consecutive number of *dry days* within a specified period, where a dry day is defined as a day with total rainfall below a threshold value.

CDD Index = Max (No. of Consecutive Days with $r_{actual} < r_{threshold}$)

This cover offers protection for long dry spells and can be sold as a standalone product or in conjunction with other indexed cover, particularly rainfall volume based products.

Some consecutive dry days products use a threshold lower than 5mm. The agronomic merits of such products are unclear; a dry spell of 30 days, with rainfall of 2mm on day 15 would still most likely result in a large crop loss, but would not trigger a claim payment.

Excess/Untimely Rainfall Index[Kharif 2004 (ICICI Lombard); Kharif 2008 onwards (ICICI Lombard, AIC, IFFCO-Tokio and Other Insurers]

Heavy and continuous rainfall within a short period has the potential to cause severe physiological damage to crops, particularly during the maturity and the harvest phases when excess rainfall makes many crops highly susceptible to attacks by pestilence and disease. The indices that have been designed to capture wet spells are similar in nature to those already described for deficit rainfall, dependent on consecutive rainy days, aggregate rainfall over a period of between two and four consecutive days, or a piecewise linear function of rainfall in each phase.

For addressing the risk of excess/extreme rainfall, insurers have come up with two types of designs. The first one defines the threshold value of rainfall during a period of 1, 2 or more consecutive days. If the cumulative rainfall within the defined period exceeds the threshold value, the insured is entitled to a payout on account of excess rainfall. The magnitude of payout is contingent on the amount of rainfall that exceeds the threshold value. The other design of excess/extreme rainfall index considers the incidence of excess rainfall event as the trigger and the sole determinant of the quantum of claim payout.

Untimely rainfall at the time of maturity and harvest stages of crop is insured through indices similar to those used for excess/extreme rainfall. However, the threshold values are much lower.

One of the inherent strengths of excess rainfall indices is that their protection benefits are more discernible and verifiable. Indices for insuring heavy rainfall can be intuitively believed to carry a lower basis risk than indices like Consecutive Dry Days (CDD) which have substantially lower triggers. Even with significant advantages, excess rainfall indices are fraught with anomaly if the triggers are set inappropriately.

2.4 Inflection Point in the Growth Curve of Weather Index Insurance in India[9]

Taking the advantage of hindsight, the journey of weather index insurance in India can be partitioned into two distinct phases. The launch of the Pilot Weather Based Crop Insurance Scheme (Pilot WBCIS) by the Indian Government can be regarded as the inflection point in the growth curve of weather index insurance.

After its entry into the developing world through the notable BASIX-ICICI Lombard-World Bank pilot during Kharif 2003, weather index insurance was hailed as a promising solution for risks in agricultural production. Its advantages vis-à-vis the traditional area yield insurance made the development practitioners and policymakers take notice of its value proposition for the huge farmer population in India exposed to weather risks in agriculture. The initial trials of weather index insurance between 2003 and 2006 revealed its high susceptibility to basis risk, a key limitation compounded by its relatively high premiums. In 2006-07, weather insurance floundered after its three-year run of impressive growth, registering a fall of nearly 25% in the cumulative acreage of the two leading insurers compared to the previous marketing year (MY). As the early facilitators of weather insurance like NGOs and agribusiness companies got aware of the major limitations of weather insurance, the difficulties in convincing

9 This section draws substantially from the following source with tables supplemented by data from other public sources:
Chapters 5 and 6 of the report on 'Evaluation Study of Pilot Weather Based Crop Insurance Scheme' commissioned by the Ministry of Agriculture & Cooperation, Government of India in 2010
Weblink:http://www.afcindia.org.in/PDF/research_reports/WBCIS-FINAL%20REPORT-060211-PDF%20TO%20AFC/WBCIS-FINAL%20REPORT-060211.pdf accessed on 17 August 2012

farmers of the economic utility for this instrument increased substantially. The entities that had been bullish on the developmental benefits and economic utility of weather insurance started turning cautious in 2006-07.

insurance penetration in India, it would not be an overstatement to aver that WBCIS has lent a new lease of life to weather insurance in India. For key stati tics of weather index insurance in India, please refer to Annexure 4.

Table 3: Area Covered under Weather Index Insurance (in Acres)

Marketing Year	AIC[10]	ICICI Lombard (Cumulative)	Cumulative Coverage* (in Acres)
2003-04	-	1,054	1,054
2004-05	5,545	5,736	11,281
2005-06	247,026	107,586	354,612
2006-07	142,048	125,185	267,233
2007-08	2,586,570	87,002	2,673,572
2008-09	928,688	458,960	1,387,648
2009-10	6,722,677	2,945,000	9,667,677
2010-11	--------		~ 33.075 million

* Coverage by other Insurers is considered negligible and thus ignored for simplicity

Table 4: Premium Collections under Pilot WBCIS (in INR million)

	AIC	ICICI Lombard	IFFCO-Tokio
Kharif 2007	70	-	-
Rabi 2007-08	1,384	32	-
Kharif 2008	317	49.4	0.3
Rabi 2008-09	359	109	3.6
Kharif 2009	1,989	144	3
Rabi 2009-10	1,611	799	-
Kharif 2010	4,547	3,321	527
Rabi 2010-11	4,281		
Kharif 2011	8,370	3,176	-
Rabi 2011-12	5,642		

Just when weather insurance was facing the threat of erosion of stakeholder confidence, it received a timely boost from Indian policymakers. During the annual financial budget of FY 2007-08 the Union Finance Minister of India laid the foundations for WBCIS, a pilot scheme for weather insurance in India supported by financial subsidy from the Government. The considerable premium subsidy towards weather insurance has improved the value-versus-price relationship for farmers. The cumulative coverage of the two insurers exceeded 9.67 million acres during 2009-10 which is slightly less than seven (7) times the total coverage of 1.39 million acres during the previous year (2008-09). Taking into account the spectacular growth in the key statistics of weather

2.5 Assessment of Current Status of Weather Index Insurance in India

Ever since the Indian Government started providing financial support to weather index insurance in the form of premium subsidy, the coverage of weather index insurance has witnessed phenomenal growth rate. From a total premium collection of approximately INR 70 million during 2006-07, weather insurance premiums in India exceeded INR 18 billion during 2011-12, signifying a growth multiple of nearly 250 times over a period of five years.

10 Portfolio for AIC in terms of Total Area Insured from 2007-08 onwards has been equated to Total Area Insured by AIC under WBCIS. The area insured under the Non-WBCIS portfolio of AIC has been ignored because of the lack of reliable data.

In the year 2010-11, as many as 15 states implemented Pilot WBCIS (Government scheme) in over 100 districts covering more than 800 blocks/tehsils. Most importantly, Rajasthan became the first state of India to implement pilot WBCIS across the entire state. Bihar did not lag behind by much as it took Pilot WBCIS to all but three districts of the state. The cumulative number of Indian farmers covered under Pilot WBCIS during 2010-11 is estimated to have crossed 9.27 million. These farmers contributed an areaof over 13.23 million hectares and a risk exposure of INR 143 billion which were insured under Pilot WBCIS in 2010-11 at a premium of INR 12.9 billion.

The overwhelming growth of weather index insurance in India since the launch of Pilot WBCIS and particularly duringthe last three yearscan be attributed to the following main factors:

a) **Improvement of affordability of weather insurance through premium subsidy:** The premium subsidy to weather insurance has ranged from nearly two-thirds (68%) to four-fifths (80%) of the total premium. The large proportion of premium subsidy has improved the price-value relationship of weather insurance manifold and enabled its trial by farmers.

b) **Ease of administration and limited financial liability coupled with the underlying benefits of objective, transparent and quick claims settlement:** Compared to its alternative area yield insurance offered under NAIS, weather insurance is easier to administer for the State agencies. It frees the respective State from the cumbersome CCEs for area yield insurance. By effectively transferring the claims burden under crop insurance to insurance companies, weather insurance restricts the liability of the respective State Government only to its share of premium subsidy for weather insurance coverage. The benefits of objective, transparent and relatively faster claim settlement under weather insurance have helped States in earning the goodwill of farmers by improving their offering under the mandatory crop insurance regime.

c) **Higher sensitivity to weather risks amid demonstration of weather insurance benefits:** The increasing awareness and sensitivity towards weather risks have made weather insurance the more favoured risk management instrument compared to traditional area yield insurance which is beset with numerous problems. Weather risks have undoubtedly gained the centre-stage among the exogenous, uncontrollable production risks faced by farmers. At the same time, the demonstration of claim benefits and the relative promptness in transferring them to farmers have backed the promise of weather insurance. During the Kharif 2009 season, reckoned to the worst crop season in India since 1972, severely affected states like Rajasthan, Haryana, Jharkhand, Maharashtra, West Bengal and Karnataka received claims from AIC that exceeded 90% of the total premium. Taking into account the subsidy of nearly 70%, these claims translated into almost 300% of the premiums charged from the farmers. Such tangible demonstration of benefits have catapulted weather insurance as the preferred risk management instrument for policy makers, marketing agencies and farmers.

It is important to note here that the continuation of support by State Governments to weather insurance is considerably influenced by the claim experience during their trials of weather insurance. Amid the widespread endorsement of the relative advantages of weather insurance, the outreach and penetration of weather insurance is likely to increase even in states which have shown lukewarm response to it after its earlier trials.

Despite its ever-increasing outreach and penetration in India, weather insurance has to meet certain conditions before one can conclude that it has indeed arrived in India. Some of these conditions are:

a) **Commensurate growth in the portfolio of non-loanee farmers:** The prodigious growth in weather insurance portfolio has resulted mainly from the expansion in the number of loanee farmers. Since loanee farmers are compulsorily covered under crop insurance,

almost the entire growth in the number of loanee farmers under weather insurance has come at the expense of the National Agricultural Insurance Scheme (NAIS) under which these loanee farmers were being covered earlier. The migration of loanee farmers from NAIS to weather insurance does not serve as sufficient evidence of its better value proposition for farmers.

Non-loanee farmers who buy crop insurance at their own volition can serve as more reliable judges of the value proposition of weather insurance. Even if the growth rate in the number of non-loanee farmers is a fraction of the growth rate in the number of loanee farmers, it can still be regarded as true evidence of weather insurance appeal.

b) **Repeat purchase by non-loanee farmers even after no claims:** Repeat purchases by non-loanee farmers, particularly after one or more seasons with no payouts can be another veritable proof of buyers' conviction in the product. Research with insured non-loanee farmers who have not received claims can provide vital insights about the value proposition.

c) **Growth in coverage of non-loanee farmers even after reduction in premium subsidy:** The high proportion of premium subsidies to weather insurance could be distorting its value-versus-price relationship. For the high claims that farmers would have received during Kharif 2009 season, the price is likely to seem cheaper compared to the utility of weather insurance. Such a situation can induce farmers to purchase weather insurance for speculation rather than its protection or risk mitigation benefits.

After weather index insurance attains a critical mass in certain regions, the relatively high level of premium subsidies can be brought down. If weather index insurance is able to sustain coverage, withoutlosing its extant subscriber base drastically, its true value would be vindicated.

2.6 Demand of Weather Index Insurance: Discussion of Limitations & Shortcomings

Despite vast theoretical promise and extensive policy development, demand for weather index insurance has been seen to be low, especially when offered on market terms (i.e. without subsidies). There is a line of theoretical papers that attempt to explain low take-up of weather index insurance in the field. de Nicola (2011) calibrates a dynamic infinite-horizon model, showing that basis risk, premium loading, and uninsurable background risk can lead to low insurance adoption. Cole et al. (2010) calibrate a simple neoclassical model and predict significant insurance demand for people with high risk aversion. On the other hand, Bryan (2010) uses a model of ambiguity aversion to show that people who are ambiguity averse will have demand for insurance decreasing risk aversion. Clarke (2011) develops a model highlighting basis risk, showing that the possibility of not receiving a payout in the bad state of the world can reduce demand among the most risk-averse individuals.

Basis Risk

Basis risk is an important limitation of index insurance as compared to traditional indemnity insurance. To put it simply, basis risk is the possibility that the insurance may not pay out even though the customer has experienced a loss (or if the insurance pays out even though no loss occurs.) There are three main types of basis risk inherent in weather insurance:

1. The first and the most commonly known basis risk stems from the difference in weather parameters between the reference weather station and the insured farm. Higher density of weather stations is the simplest method of reducing the basis risk from spatial separation. From less than 500 weather stations in 2005, this number is expected to exceed 2000 weather stations by 2010. The demand and location of most of the newly installed and upcoming weather stations is driven by weather insurance. Considering the focus on increasing weather station density, basis risk

due to spatial variability of weather is getting reduced organically and can be brought to acceptable levels within the medium term (1-3 years).

2. The second type of basis risk is inherent in the design of weather insurance contract. The index and the parameters of the contract may not accurately capture the crop loss caused by weather. Theoretically there are unlimited weather index designs which differ in the level of basis risk. With the overwhelming growth rate of weather insurance in India, improvements in contract design may take a backseat among other key challenges. Difficulty in discriminating different weather indices may deter regulators, insurance facilitators, and farmer customers in unraveling the technicalities in weather insurance contract. Weather insurance products lie at a crossover of agriculture, statistics, meteorology, and financial economics, each of which is a specialized field of knowledge with limited expertise available. Evaluating a diverse portfolio of weather insurance designs and their appropriateness for different setting and customer segments is a specialized task: this reality may take time to dawn on regulators and policy makers. Therefore the treatment of basis risk of this type seems uncertain at this juncture.

3. Another type of basis risk, the third and the final one, has not been documented so far, is inherent in the weather event or weather parameter. Each weather event may manifest itself differently based on its intensity, duration, time of occurrence, crop exposed etc. These conditions can alter the effect of weather perils with which we associate a standardized response. For example, even an innocuous rainfall of 20 mm in a day can wreak havoc if it takes place in a very short duration of time. A drought event (low intensity drought) or sowing event has higher basis risk than extreme rainfall event since a small quantity of rainfall typically 10-15 mm can make a big difference in outcomes whereas 10-15 mm rainfall may not alter the loss impact for an extreme rainfall event (e.g. 200 mm in 2 days). This third type of basis risk is currently below the threshold of consciousness among the stakeholder in the weather insurance domain.

Inadequate Indemnification in Bad Crop Seasons

The envisaged benefits of weather insurance (or crop insurance in general) is to provide an income support during lean cropping seasons, avoid loan defaults and facilitate access to credit for subsequent seasons. A frequent but insignificant payout may not help in either of these and may not also be in line with the expectations of the farmers.

Weather insurance as a risk mitigation product has not proven to be suitable in cases where crop production is impacted by a combination of perils or where pestilence accounts for major drop in yields. One of the common criticisms of weather insurance has been its limitation of insignificantly compensating the insured farmers for even the worst of crop seasons (e.g. Kharif 2009).

In the current government-driven Pilot WBCIS with capped premium rates, an improvement in payout levels may be possible only by reducing the number of indices (or alternatively perils insured) included under the weather index insurance product.

The following case study of a discerning customer aptly highlights how the issue of suboptimal indemnification by rainfall insurance could be brought out during its very first trial. [11]

Such a situationfor even an apparently well-designed weather insurance contract may be the result of the inadequacy in any or both of following parameters namely, the maximum sum assured, and the maximum probable loss. The term 'total sum assured' in weather insurance contract may be deemed anomalous in the sense that even when a farmer has lost the entire crop during a particular stage, the compensation accruing to that farmer under the policy

11 Source: Rainfall Insurance: Documentation of Sajjata Sangh Initiative in Gujarat to Understand Requirements for Sustainable Upscaling
Weblink: http://www.sajjatasangh.org/doc/pubs/Rainfall%20Insurance.pdf

"Rainfall Insurance is transparent and paid out at the right time but claims are small compared to my actual loss" - GovindbhaiSomabhaiChavda, Shahpur, Mangrol, Junagadh, Gujarat

"Providences are stronger than deliberations." Few things would epitomize it better than Govindbhai's trial of rainfall insurance. It was one of those routine trips from his village to Mangrol during which Govindbhai saw a group of his fellow-villagers listening attentively to some talk by an outsider. A part-time farmer but a school teacher by occupation, Govindbhai could not douse his curiosity and ventured further to gain more details. Never could Govindbhai or anyone else have imagined that he would walk out with a stake much bigger than any of them who had been deliberately called to participate.

Govindbhai ended up having a rainfall insurance coverage for 5.5 acres. The role of premium subsidy by AKRSP (I) (the facilitating NGO) did play a big role in Govindbhai's decision as he clearly put it, "Subsidy by AKRSP(I) was a key motivator as I would have been reluctant to take chance with entire premium burden on myself."

The higher stake and the occupational traits (being a school teacher) made Govindbhai drill deeper into the nuances of his rainfall insurance. His keen observation was apparent when he pointed out, "The cheques for payment of rainfall insurance claims did not have an at-par facility which cost me some precious rupees." Despite his incisive eye, he attributes his experience of rainfall insurance to sheer luck, "I just came to know about weather insurance by chance. In the end, it turned out to be a good bet for me."

For a part-time farmer, one may imagine that Govindbhai would have been content with getting an indemnity payout of nearly three times the premium paid by him. In his words, "Claim received by me is a small portion, about 50%, of the actual loss suffered by me." He goes on to articulate his situation better, "After I had invested INR 22,000 for 5.5 acres of my crop, I spent Rs 3500 as premium to insure my investment. Why should I be satisfied with a total payout of INR 10,000 only when my actual loss in term of my investment is much higher at INR 17,500? If I start considering the loss in terms of potential revenue, the payout seems even smaller."

The explanation that basis risk and the covariant nature of rainfall insurance result in distortions of payouts vis-à-vis the actual losses of an individual farmer fails to placate Govindbhai. He avers, "I do not wish to be paid out in normal years but whenever I suffer a big loss, I should a get a reasonable claim." Will weather insurance ever be able to address Govindbhai's requirement?

may not be the maximum sum assured under the weather insurance contract. It will be rather simply the addition of the sum assured of the weather insurance covers operative during that stage. The consequent indemnity may only be a fraction of the maximum sum assured under the weather insurance policy bought by the farmer. The maximum probable loss denotes the highest cumulative payout (sum of payouts of all constituent covers) among all the cumulative payouts simulated historically from a weather insurance contract. The quantitative difference between maximum sum assured and maximum probable loss for a weather insurance contract represents a theoretical gap between the maximum payout committed by that contract and the actual payout that could be expected from that contract in extremely adverse year(s).

State Government Involvement in Weather Index Insurance Design

The design of weather index insurance product is like to a black box which has weather data as an input and a term-sheet as an output, with the intermediate process continuing to remain a mystery for even seasoned industry personnel or academician. For a common man, the simplest evidence of a good weather index insurance design is its claim payout during seasons which are adverse or devastating on a widespread level. Because of the typical structure of a weather insurance term sheet, farmers may not find it easy to unravel the technicalities in the design of weather insurance. In the absence of technically-equipped but non-partisan entities in the domain, agencies of the State Government (usually a team of representatives from Agriculture/Horticulture/Eco-

nomics/Statistics Departments) carry out the design of specifications for weather index insurance products; the appraisal of products proposed by insurers; and the fine-tuning of the selected products. While the intent of such agencies working on behalf of respective State Governments is to ensure a fair transaction between the supply side and the demand side of weather index insurance, the benefits from their close involvement have been largely counter-productivetaking into account their inability to exploit the tremendous potential of weather index insurance.

Owing to the practically limitless number of designs possible for weather insurance, the task of designing a template for appropriate products or of appraising the contextual suitability of a diverse portfolio of weather insurance designs is a specialized task that unfortunately has not been able to attract the level of attention it truly deserves. For example, establishing a deterministic relationship between weather and yield is an extremely difficult proposition given the large number of influencing factors. For instance, the water requirements of crops are not uniform and are critically affected by the plant physiology, soil type and other weather variables like temperature and humidity. A higher rate of evapo-transpiration owing to higher temperatures, even with the same level of rainfall, increases the water requirement for the crop. Factoring in considerations of basis risk, the tasks of identifying appropriate weather indices becomes even more demanding.

The specialized nature of product development, the esoteric terminology used in a termsheet, and the concoction of agro-meteorology, statistics and economics within the underlying parameters have the undesirable effect of turning weather insurance into an incomprehensible device. By underestimating the technicalities involved in weather index insurance design and by harboring a misplaced sense of confidence about their intervention in the product development process, agencies of the State Governments could be deemed responsible for inadvertently eroding the value of the funds that Governments and farmers have committed so far under the Pilot WBCIS.

Social Costs of Improper Evaluation of Weather Index Insurance Offerings

The total premium charged by an insurer for its weather insurance product is constituted of two main components namely expected loss and risk margin. The burning cost derived from the simulation of pay-outs of a weather insurance contract is taken as the expected loss. This component is expected to be paid out (on an average basis) for every season of coverage under a given weather insurance contract. The other component – **risk margin,** is determined by the risk preferences of the (re)insurance company providing the risk protection: that is, by how they measure the cost of risk with respect to return for the purposes of risk management, capital allocation and business expenses.

As part of an evaluation study on Pilot WBCIS commissioned in 2009-10 by the Ministry of Agriculture & Coop, a comparative evaluation of a sample of four contracts offered in Rajasthan (the state with the highest experience of weather index implementation) was conducted. Despite an active involvement and keen oversight of the designated agencies of the State Government, it was seen that one of the insurers could charge risk margins ranging from 74% to 93% in each of its four contracts sampled for comparative evaluation. It is self-evident that with less than 30% of the premiums going towards expected loss, the level of protection offered to farmer-subscribers covered by the four contracts was severely compromised with the insurer appropriating more than its fair share of margins.

Though the clarity on desirable level of risk margins is still amiss, the above finding brought to the fore the need for a specialized entity for benchmarking weather index insurance offerings of participating insurers in government scheme/programme.

Continued Disregard of Key Influencers of Weather Index Insurance Effectiveness

In the initial years of weather index insurance in India, simplicity of product was preferred over scientific precision. Even as farmer-subscribers, implementing agencies and the facilitators in the domain became increasingly aware of the working of weather index insurance as well as the anomalies/deficiencies in its design and implementation, efforts were expected to rectify these automatically over time. Instead of undertaking measures to compensate for or to correct these anomalies/deficiencies, the implementing agencies have continued to ignore them. This has perpetuated the sub-optimal design and implementation of weather index insurance that is out-of-sync with the desired/expected state. Some of the anomalies/deficiencies are discussed below:

Sowing/Planting Dates and Dynamic Dates for Crop Stages under Weather Index Insurance: Most field crops, which are of strategic importance to the food security of our economy, need to be sown or planted by farmers in their respective growing season. *Sowing/planting dates have a proven and significant influence on the occurrence of subsequent crop stages and their durations.For Kharif season (the main cultivation season during monsoons), the sowing/planting date is a function of the sowing/planting rainfall which varies from location to location.* There are two ways in which the dynamic sowing/planting date (varying from location to location and year to year) can be built into the weather index insurance contract. One way is to incorporate the specific triggers which reflect the ideal conditions for sowing/planting, into a weather index insurance contract. Suppose for groundnut in Gujarat, the ideal condition for sowing/planting is more than 60 mm rainfall in 2-3 consecutive days. The date of sowing/planting event can be identified from the weather data which may later be validated from local officials in the agriculture department. The dates of the subsequent crop stages can be made dependent on this sowing/planting cover, included in the weather index insurance contract. Another way is to offer weather index insurance contracts in a location after the completion of the sowing/planting event in that location. A basket of weather index insurance contracts can be offered to farmer-customers, in which the dates of constituent covers have start dates and durations, corresponding to the specific sowing/planting date of that farmer-customer. Implementation of the latter approach would require the development of software applications for automation of weather index insurance product design/structuring.

Exclusion of Farmers from the Design Process of Weather Index Insurance: Despite the almost unlimited possibilities in the design of weather index insurance, the inputs or the voice of the ultimate beneficiary i.e. the farmer-subscriber continues to be excluded from the design process and implementation of weather index insurance. Though there are veritable evidences of the benefits of farmer-participation in the design and implementation of weather index insurance, the ultimate aim should be to place the control of weather index insurance design and implementation in the hands of the farmer-subscribers. Such a goal can be actualized through adoption of modern software technology for dynamic, real-time development of weather index insurance products by farmer-beneficiaries. The application of automated platforms will empower the farmer-beneficiaries not only to develop personalized weather index products fitting their individual requirements and context but also to appreciate the inherent trade-offs in the design of such products. Such a provision would not only improve the understanding of the Weather Insurance product among farmers immensely but also make the process of weather index insurance development more decentralized and demand-driven thus freeing the implementing agencies from unrealistic expectations and undeserved blame. [12]

Development of Integrated Data System for Weather Index Insurance: Data is critical for weather index insurance to generate credible results in terms of payouts. The greater the quality and duration of the data, the stronger would be the forecasting capability of the weather insurance models. Crop loss data and hydro-meteorological data are the basis for the development of vulnerability functions to estimate overall risk leading to indemnification under crop insurance.

12 Source: Rainfall Insurance: Documentation of Sajjata Sangh Initiative in Gujarat to Understand Requirements for Sustainable Upscaling
Weblink: http://www.sajjatasangh.org/doc/pubs/Rainfall%20Insurance.pdf

It is indispensable for improvement of weather index insurance that crop loss data be gathered in a more systematic manner, that losses be recorded by peril and at the highest level of resolution possible. Having high resolution loss data would first improve the robustness of the vulnerability functions as the correlation between weather hazard and crop loss would be more spatially representative. Likewise, hydro-meteorological data are the basis for hazard quantification. The more detailed and complete the hydro-meteorological data, the better the results. At present, long-term weather/rainfall data is largely limited to IMD stations and in some cases data on rainfall parameters from the state government agencies. In such situation, technology such as TOPS could be relied upon for obtaining a better understanding of the spatial variation of hazard.

Distorted Incentives for Research and Development on Weather Index Insurance: Before the advent of Pilot WBCIS - the highly subsidized scheme for weather index insurance, insurers were striving hard to offer weather insurance products which fulfill the expectations of farmers and other key stakeholders. All of the insurers had associated with at least one specialized external agency for research and technical support on weather index insurance product development. Both the leading insurers under Pilot WBCIS had previously availed the assistance of IARI - India's leading research institution in agriculture. Despite the apparent synergies, the desired outcomes could not be achieved because of mismatch in resource requirements (time, investment in research, manpower etc.) required to make a significant breakthrough. The limited size of weather insurance

"Not resting with the encouraging claims in first year itself, our goal is to design Weather Insurance ourselves." - SonikbhaiBacchubhai, Nani Dhanej, Maliya Hatina, Junagadh

Sonikbhai is one of the ever-diminishing breed of rural folk in India which earns 100% of its income from agriculture. By putting his mind and soul to agriculture and always striving for improvement, he has been able to distinguish himself as one of the most discerning farmers of his region. However, the growth of Sonikbhai is not limited to his mental faculties; he could bring a method to the madness in agriculture and has thus reaped good material success.

Never shying away from experimentation, he was one of the votaries of rainfall insurance during Kharif 2009 season. Taking cue from him, many medium and large farmers of his region tried rainfall insurance and could see its benefits in the first year itself. But instead of feeling vindicated, Sonikbhai laments, "Premium rates of rainfall insurance are quite high. If premiums were in the range of two hundred to three hundred rupees per acre, many smallholders would also have reaped the benefits of rainfall insurance."

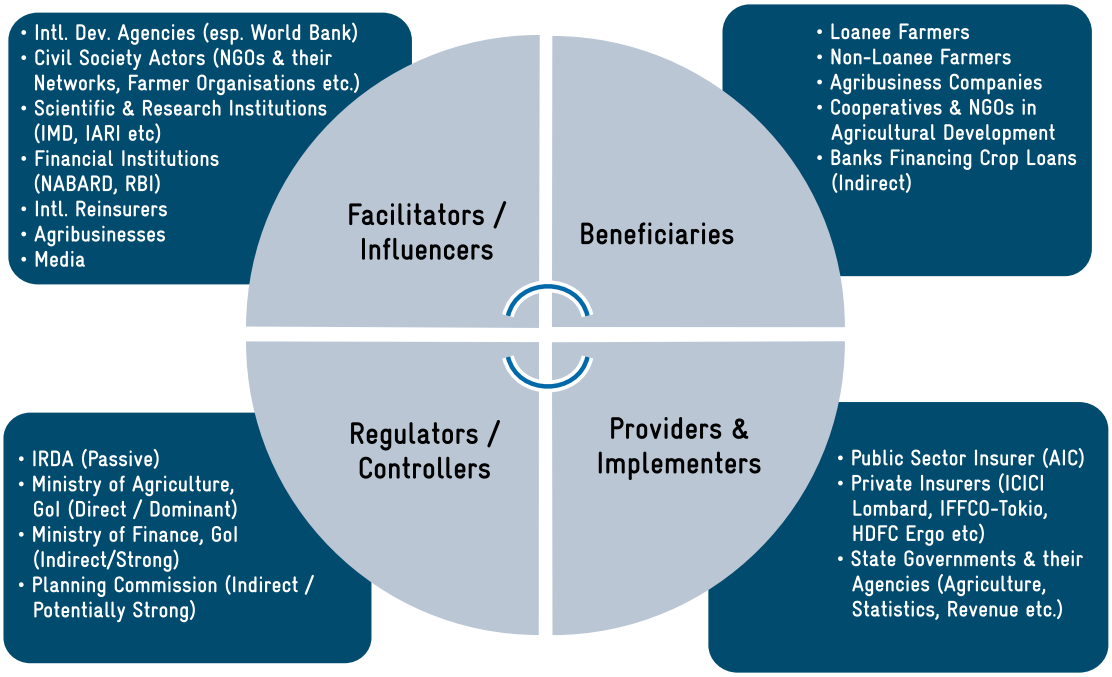
After being explained the reason for higher premiums, Sonikbhai instantly comes up with a wonderful suggestion, "Perhaps we should have separate weather insurance policies for small and large farmers." He nevertheless underlines the overarching importance of payouts in the initial years of weather insurance participation by admitting that, "If claims would not have happened, it would have been extremely difficult to sustain this useful programme initiated by AKRSP(I), (the facilitating NGO)."

Impressed with the benefits of weather insurance, Sonikbhai visualizes a bigger role for farmers to make this risk management tool more encompassing. He recognizes the value farmers can bring to the design of weather insurance policy, "There should be a committee of farmers which should work towards the design of weather insurance." Bringing in an element of realism, Sonikbhai proposes that farmers can initially play a supportive role by contributing towards customization of weather insurance specifications. He strongly believes that once the farmers gain clarity and experience of weather insurance designing, they have to be handed over the lead role.

portfolio, reasonable uncertainties regarding its scalability and high claim ratios were some key deterrents for insurers to sustain investments in weather insurance product research and development with a long-term view. After Pilot WBCIS boosted the demand and scale of weather index insurance through high premium subsidies and mandatory coverage of loanee farmers, the incentives for research and development by insurers took a backseat to harvesting of short-term benefits by virtue of informational advantage over the state government agencies implementing the ambitious pilot. In the absence of proper involvement and investment by the Government or suitable developmental entities interested in the long-term improvement of India's crop insurance sector, developmentof well-aligned products seems a distant possibility. The challenges are compounded by the fact that weather index insurance products lie at a crossover of agriculture, statistics, meteorology, development economics, and financial risk management, each of which is a specialized field of knowledge with limited expertise available. Therefore the task of identifying resource persons with good understanding of more than one or two of the above fields is quite challenging and requires substantial efforts to bring such rare expertise on board.

Low Impetus on Literacy and Technical Understanding of Crop Insurance among Farmers: There are substantial challenges in marketing weather index insurance products or similar crop insurance schemes to farmers with low levels of literacy and limited financial sophistication. Most marketing entities in the field and even personnel from the insurance company have their own doubts when it comes to understanding the specific aspects (pros & cons, working etc.) of the two most popular crop insurance schemes - namely NAIS and WBCIS. As evident from the various evaluation studies on crop insurance, huge gaps are seen with regard to proper understanding of insurance in general and weather index insurance in particular. These gaps negate the benefits of a competitive market in terms of the variety of weather index insurance products offered by different insurers. Nevertheless, to sustain the conviction of the ultimate patrons of crop insurance i.e. farmers, a regular stream of investments need to be made towards financial literacy and capacity-building of farmers. When we take into account the financial outlay of the government on providing crop insurance to farmers of India, the expenditure on its dissemination and promotion could be, at best, be considered marginal vis-à-vis the annual revenue expenditure on operations and financial support (subsidies).

2.7 Mapping of Stakeholders in Indian Crop Insurance Domain



3. Responses to Gaps and Challenges in Crop Insurance

3.1 Government's Current Thinking and Policies on Crop Insurance

The overwhelming view within the Government is in favor of placing the Indian crop insurance programme, in an actuarial regime, in which, the insurance company receives premium based on commercial rates and is responsible for all indemnities. The advantages of this regime are expected to accrue to all the concerned stakeholders:

(i) risk transfer to international markets through reinsurance route

(ii) the government would be able to budget its expenditure accurately and at the beginning of the year, as it would relate only to premium subsidy;

(iii) the insurer has an incentive to be accountable and professional in administering the program;

(iv) farmers would receive claims early, with settlement by the insurer without having to wait for receipt of funds from the government

Under the proposed arrangement, the government would decide the premium payable by the farmer, and the difference between the actuarial rates and the rates payable by the farmer, would be borne by the government. The general view is that the premium subsidy may range from 25 percent to 75 percent at different slabs of actuarial premium (subject to a maximum net premium of 8 percent for farmers). Actuarial premium rates could be applied at district level, by managing the indemnity levels in an equitable manner, vis-à-vis the risk of each insurance unit. To the extent possible, irrigated and un-irrigated areas with respect to a crop, have to be notified separately, so as to charge premium rates, commensurate with the risk. Crops with gross actuarial premium rates of 20 percent or more may not be included in the actuarial regime. The government may also consider excluding such crops from the insurance net, and may provide support for these under catastrophe/relief programs. In due course, an alternative to CCEs based yield estimates, e.g. satellite imagery etc. has to be developed for getting accurate and timely yield reports, for processing claims. The possibility of channelizing at least a portion of the agricultural relief and other related funds, through crop insurance, is also being deliberated as the efficiency of government money spent is the highest through the insurance route.

The Planning Commission in its publication "Towards Faster and More Inclusive Growth – An Approach to 11th Five Year Plan", published during December 2006, highlighted the need for safety net and desirability of insurance. The relevant portion is reproduced hereunder:

> *"All farmers do not have the ability to bear downside risks and this is evident from the spate of farmer suicides when new seeds fail to deliver expected output, or expenditure on bore wells proves infructuous, or when market prices collapse unexpectedly. Farmers should be protected against such risks by appropriate measures. Insurance is one way of doing this, but only 4 percent of farmers are currently covered by any crop insurance. The financial cost of existing and proposed crop insurance schemes is considerable, as well as recurring. Moreover, current crop insurance is only against yield loss and does not cover price risk. Farmers also lack cover against other risks, for example accidents which can also prove crippling. These and related issues of risk management are again largely non-Plan areas but need to be addressed during the 11th Plan.*

This should ideally be done by concentrating on innovations in design which could help expand insurance in a manner that is financially viable without excessive subsidy"

Report of National Development Committee's Subcommittee on Agriculture and Related issues (July 2007)has come out with more concrete policy direction on farm insurance. It is felt desirable not to have a single national model for extending crop risk insurance coverage to the farmers, as the risk profiles are different across territories and crops. Moreover alternative models of crop insurance, viz. weather insurance etc. are available. NDC is in favor of encouraging states to develop and adopt their own models of risk management in agriculture in line with the Joint Group and Working Group recommendations. While the central government will undertake to participate in both infrastructure development and subsidy sharing, it is recommended that the premium subsidy on NAIS (in actuarial regime) should be removed from 'Plan Expenditure' to 'Non-Plan Expenditure' side. The central government may come out with two different schemes to support extension of actuarial based crop insurance scheme by the state government. First, a Centrally Sponsored Scheme to support infrastructure development in sharing with state for administration of crop insurance products and second, an additional central assistance to provide for the central government contribution for subsidies that may be involved in the insurance schemes initiated by the state governments. The central government's obligation and sharing pattern can be in broad conformity with the sharing arrangements recommended by the Joint Group as well as the Working Group. NDC also felt that the crop insurance covered under the government's subsidy regime should not include high risk crops. NDC also concurred with Working Group's view that the subsidy may be graded depending on actuarial risk.

3.2 Emergent Scenario from Government Policies on Crop Insurance

In its quest for an optimal crop insurance regime in India, the central government has been simultaneously working with the three types of crop insurance schemes in India, namely NAIS – the flagship crop insurance in India based on traditional homogenous area index insurance, Pilot WBCIS – the alternative scheme to area index insurance which revolves around weather indices and mNAIS (modified NAIS) – a hybrid scheme drawing upon the desirable elements of area index and weather index while having an actuarial pricing.

Modified National Agricultural Insurance Scheme (mNAIS)

mNAIS can be regarded as a highly improvised form of NAIS (please refer to the text box on next page for main features and key benefits). It was approved for its implementation on pilot basis in 50 districts from Rabi 2010-11. During Rabi 2010-11, AIC implemented mNAIS in 32 districts in 12 States insuring 345,001 farmers for a sum insured of INR 6.91 billion against premium of INR 452 million. During Kharif 2011, AIC implemented mNAIS in 31 districts in 13 States insuring 417 thousand farmers for a sum insured of INR 11.3 billion against premium of INR 1.1 billion and during Rabi 2011-12 in 37 districts in 16 States insuring 5.97 lakh farmers for a sum insured of INR 15.3 billion against premium of INR 1.4 4 billion. Total claims in respect of Kharif 2011 are INR 591.5 million. Pilot mNAIS is being continued during 2012-13 as well(Annual Reports of AIC, 2010-11 and 2011-12).

Surprisingly, mNAIS, despite improving upon on all the major drawbacks of NAIS and offering the specific advantages, has not been rated very favorably in one of the recent evaluation study commissioned by AIC. The practical difficulties in implementation of the scheme in terms of the physical and human infrastructure requirements seem to have contributed to its lack of appeal among the state governments. While there was unanimous acceptance of the fact that the improvements have made mNAIS more practical and farmer-oriented, these have been overshadowed by the administrative difficulties in its implementation and the long time period for claim settlement.

The first and foremost importance of any crop insurance program is the reliability/accuracy and timeliness of the data. On both these aspects, mNAIS has a long away to go. Though the officials of the implementing agencies in state governments felt

that reducing the number of CCEs (crop cutting experiments) from eight to four at the level of Village Panchayat - the lowest insurance unit has cut down the load on the state administrative machinery, the reliability/accuracy of the data may be compromised in the process. Needless to say, major efforts have to be taken to ensure timeliness, accuracy and consistency of yield estimates reported through the CCE process under mNAIS.

Modified NAIS (mNAIS)

Main Features of mNAIS

- **Actuarial regime:** The mNAIS scheme operates on an "actuarial regime" in which the government's financial liability would be predomi¬nantly in the form of premium subsidies given to AIC and funded ex-ante, thereby reducing the contingent and uncertain ex-post fiscal exposure currently faced by the government under NAIS, and reducing delays in claims settlement
- **Up-front premium subsidies:** AIC receives premiums (farmer collections + premium subsidies from the government) and is responsible for managing the liability of the mNAIS through risk transfer to private reinsurance markets and risk retention through its reserves and is able to operate on a sustainable basis.
- **On-account partial payment:** The mNAIS product continues to be based on an area yield-based approach, with a provision for an early part payment to farmers (in season) based on weather indices.
- **Small IUs:** Crop-cutting experiments conducted to assess crop yield estimates are lowered from the block level to the village level to reduce basis risk (i.e., the mismatch between the actual individual crop yield losses and the insurance indemnity).
- **Cut-off dates:** Adverse selection is reduced through the enforcement of early purchase deadlines in advance of the crop season.
- **Additional benefits:** Additional benefits are offered for prevention of sowing, replanting, post-harvest losses, and localized risk such as hail losses or landslides.

Key Benefits from mNAIS

- Actuarial rating enables risk-based pricing and ex-ante estimation of subsidy (better budget management).
- Risk-based pricing helps differentiate risks and improve equity between farmers. Risk-based pricing can also be used for agriculture policy signaling. For example, in the case of a crop with a very high premium rate, the mNAIS could indicate that it should not be grown in a given area, and this could feed into agriculture extension policy.
- Ex-ante subsidy determination enables up-front government and farmer contributions toward premiums, thereby passing residual risks to the insurers (market approach) and enabling fast claim settlements.
- Combining weather-indexed insurance (that allows for quick payments and enables interim payments within a crop season) with area yield insurance (that allows for payouts with closer correlation to yield losses) makes the best use of both indices.
- Improving the underwriting terms and the conditions of crop insurance policy, such as purchase deadlines and additional benefits, makes the product more sustainable.
- Increasing competition and expanding the role of the private sector in crop insurance contribute to the promotion of effective public-private partnerships in agricultural insurance.

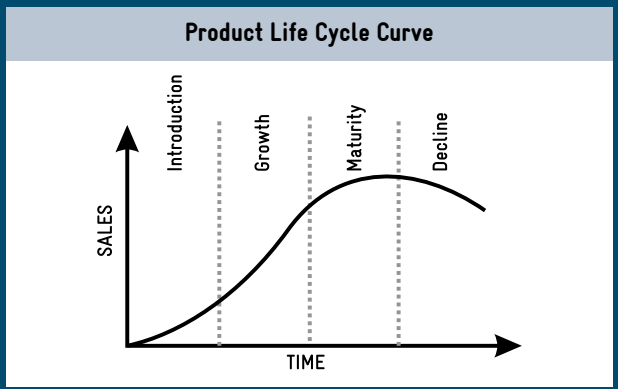
4. Crop Insurance in India: Strategic Assessment and Suggested Inverventions

4.1 Strategic Assessment

It would not be an overstatement to say that the crop insurance sector in India has witnessed far more dynamism, action and attention in the last decade (2002-12) than in the preceding three decades combined (1972-2001). The sensational advent of weather index insurance, and the carving-out of mNAIS from NAIS have accentuated the vigorous churn necessitated in the Indian crop insurance space by the withdrawal of the Government from the role of the risk-bearer of the last resort. This churn has been moderated by the increasing role of international development institutions and the growing impetus on competition through private sector participation in the insurance sector.

In terms of product life cycle, weather index insurance can be regarded as going through its growth stage while mNAIS is its introduction stage. The recent developments augur a stage of decline for the flagship crop insurance scheme which is rapidly losing ground to its younger competitors.

Chart 1: Product Life Cycle Curve



Almost all the entities on both the supply and demand sides for crop insurance are benefitting from the vigorous developments taking place in the sector. By virtue of their novelty, the offerings under WBCIS and mNAISimpart an informational advantage to players on the supply side w.r.t. those on the demand side. Equally important, if not more important, the viewpoints of the non-transactional actors (entities influencing the transactions between the supply and the demand side) have to be carefully interpreted as these actors have a balanced association with both supply and demand side entities and are usually endowed with a utilitarian orientation. The non-transactional actors mainly include welfare entities like agencies and organs of the state, development institutions, civil society organizations (social/ voluntary organizations, scientific and research institutions, media bodiesetc) and non-partisan individuals (volunteers/independent experts). However, the projections of the future state of crop insurance sector in India as viewed by various stakeholders, including both transactional and non-transactional entities, are likely to be heterogeneous and intermingled with skepticism, hopes and pragmatism.

It would be more fitting to consider the current state of crop insurance sector in India as transient or 'at the crossroads'. Unless a consensus regarding the relative utilities of the three types of crop insurance emerges within the government, the sector will see the continualemergence of schemes and policy measures. More than the uncertainty for the various stakeholders, the bigger concern would be the process followed by the government to arrive at a definite conclusion. Considering the multiplicity of perspectives and the frequent learning cycles taking place within the crop insurance domain, thepossibilityof impressionistic decisionstaking precedence over reality-based rationality cannot be entirely ruled out.

The case is therefore apparent for the constitution of a think-tank that can guide policy-making for the crop insurance space. If one pays attention to the undercurrents, this think-tank may initially take the form of the proposed 'Technical Support Unit' for crop insurance, working under the aegis of the controlling department of Ministry of Agriculture and Cooperation, GoI.

4.2 Suggested Interventions

An understanding of the development of the Indian crop insurance program, its current state (gaps, constraints, Government's recent thinking) and its likely policy direction signal the relevance of the following project interventions:

S. No.	Intervention	Technical Competency/Resource Requirements
1.	Support for Design & Implementation of Technical Support Unit for Crop Insurance	• Project Planning & Design • Fundraising from Relevant Stakeholders • Selection & Induction of Core Partners & Affiliates • Management & Course Correction of TSU • Policy Guidance & Advisory related to Crop Insurance
2.	Development of Integrated Data System for Crop Insurance	• Consolidation of Relevant Historical Data for Crop Insurance (Crop Loss, Hydro-meteorological Parameters, Scientific Experiments & Media Archives • Conceptualization & Design of Integrated Data System • Linkage Development for Periodic, Timely Availability from Key, External Providers and Trustees • Implementation of Pilot Projects and Field Experiments to Identify Solutions for Key Data Gaps • Maintenance, Update and Subsequent Transfer of Responsibility to Relevant Entity
3.	Reduction of Basis Risk in Index-based Crop Insurance	• Evaluation of Technology like TOPS with Potential for Reduction of Geographic Basis Risk • Evaluation of Technologies (e.g. Remote-Sensing) & Approaches for Improved Estimation of Crop Yields • Support to Research and Development of Products with Lower Basis Risk due to Design • Assessment of Suitability of Index-Plus (localized assessment based) Crop Insurance solutions
4.	Empowerment of Farmers and Facilitating Organizations for Development of Context-driven Crop Insurance Products	• Promotion of Financial Literacy regarding Crop Insurance • Capacity-building of Lead Farmers for Evaluation and Customization of Crop Insurance Products • Development of Linkages between Different Stakeholders for Fulfillment of Feasible, Realistic Crop Insurance Demands of Farmers

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Annexure 1: System for Annual Estimates of Crop Production in India

For collection of area statistics, the states are divided into three broad categories,namely:

(i) States and UTs which have been cadastral surveyed and where land records are maintained by the revenue agencies generally referred to as "Land Record States". Seventeen states and four UTs accounting for about 86 percent of the reporting area are covered under Timely Reporting Scheme (TRS) as part of which 20 percent villages are selected on a random basis for complete area remuneration.

(ii) States where area statistics are collected on the basis of sample surveys under a scheme for Establishment of an Agency for Reporting of Agricultural Statistics (EARAS). These states account for about 9% of reporting area.

(iii) Hilly regions from North-Eastern parts of India and some UTs where no reporting agency has been functioning, the work of collection of Agricultural Statistics is entrusted to the village headmen. The area statistics in these states are based on impressionistic approach and account for about 5 percent of the reporting area.

The yield estimates of crops are obtained through Crop Cutting Experiments (CCE). At present over 95 percent of the production of foodgrains is estimated on the basis of yield rates obtained from the CCEs. Field Operations Division (FOD) of the National Sample Survey Office (NSSO) provides technical guidance to the states and Union territories for organizing and conducting Crop Estimation Surveys.

Final estimates of production based on complete enumeration of area and yield through crop cutting experiments become available long after the crops are actually harvested. However, for policy formulation four advance estimates of production are released during the course of the year. The first estimate of area and production of *kharif* crops is prepared in September, when South-West monsoon season is about to be over and *kharif* crops are at an advanced stage of maturity. The second advance estimate comprising of both *kharif* and *Rabi* crops is released in January. The third advance estimates are released towards the end of March/ beginning of April every year based on the deliberations in Crop Weather Watch Groups (CWWG), information made available by State Agricultural Statistical Authorities (SASAs) and remote sensing data by Space Application Centre, Ahmedabad. The fourth advance estimates are released in the month of June/ July, after most of the *rabi* crops get harvested by the end of May and SASAs are in a position to supply the estimates of both *kharif* and *rabi* seasons as well as the likely assessment of summer crops. These are validated with information available from other sources.

Annexure 2: Chakravarti Model of Agricultural Insurance

According to Chakravarti (1920, referred to in Mishra 1995), agricultural insurance in India should be a package consisting of the following, in increasing order of priority as per conditions prevailing during the times: (i) Insurance of buildings, granaries and agricultural implements (ii) Cattle insurance (iii) Insurance of crops. He identified that the most important element of a system of agriculture insurance is the assumption of the risk of loss or deficiency in respect of crop production, which forms the core of his scheme of agricultural insurance because of its importance and complexity. By grouping insurance of houses, implements, cattle, etc, can with other types of property insurance, it left the system of agricultural insurance to grapple with crop insurance.

The detailed scheme of agricultural insurance laid down by Chakravarti was sensitive to the issues of basis of insurance i.e. whether the basis of insurance payout should be on the basis of value of the crop or on its quantity. His preference was for value rather than quantity as the basis of insurance given the inverse relationship between quantity and price of produce and eventualities in bad crop seasons. He took due consideration of indemnification level, role of the state within an 'area approach' analogous to Dandekar's (1976) homogenous area approach. He emphasized the problems of 'human elements' i.e. moral hazard in crop insurance and suggested a scheme of drought insurance.

According to him, the usual remedy applied in other types of insurance to overcome the problem of moral hazard is 'partial insurance or under- insurance or deductible'. Chakravarti rightly argued that this remedy may not be effective in case of crop insurance, because the crop to be insured is yet to exist and the state of its existence thereof would depend on the actions of the insured farmer which an insurer would not be able to monitor easily. This, according to him was likely to reduce the benefit of insurance and hence its demand. In addition to information asymmetry problems, he identified other constraints like illiteracy of most cultivators, inadequate village statistics and general backwardness among the population.

Salient Features of the Chakravarti Model

Some important features of the scheme are as follows:

i) The scheme is area-based and rain-gauge station specific.

ii) A year is divided into two seasons.

iii) Indemnity is payable if the total rainfall during a season is less than 65 per cent of the normal rainfall. The percentage criterion can be varied depending on the agro-climatic features of the area. Indemnity is determined with a view to stabilizing a farmer's net income. Assuming that a farmer can get one-third of his net income even in a bad year, the scheme aims at an indemnity equivalent to two-thirds of his income.

iv) Premium is calculated on the basis of the likelihood of a drought occurring and the size of indemnity indicated above.

v) The scheme is designed to be self- financing. Coincidentally, the amount of premium turns out to be equal to the land tax for a unit of land. This makes the premium rate simple to determine, and variable with land quality and hence a farmer's net income.

vi) Though the scheme was designed primarily for annual contracts, quinquennial or decennial contracts were recommended with a view to enhancing the economic benefits to farmers.

vii) Land owners and tenants are eligible for insurance coverage.

viii) The scheme also envisages insurance policies for co- operative societies and groups of farmers.

Annexure 3: Key Operational Details of National Agricultural Insurance Scheme (NAIS)[13]

The crop insurance scheme currently being implemented in India is the National Agricultural Insurance Scheme (NAIS) which started from Rabi 1999-2000 season. Agriculture Insurance Company of India Ltd. (AICIL) took over the implementation of National Agricultural Insurance Scheme which until the financial year of 2002-03 was implemented by the General Insurance Corporation of India. The details of the scheme are explained below:

Objectives

The objectives of the NAIS (RKBY) are as under:

(i) to provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases;

(ii) to encourage the farmers to adopt progressive farming practices, high value inputs and higher technology in agriculture; and

(iii) to help stabilize farm incomes, particularly in disaster years.

Benefits expected from Scheme

The Scheme is expected to:

i) be a critica1 instrument of development in the field of crop production, providing financial support to the farmers in the event of crop failure;

ii) encourage farmers to adopt progressive farming practices and higher technology in agriculture;

iii) help in maintaining flow of agricultural credit;

iv) provide significant benefits not merely to the insured farmers, but to the entire community directly and indirectly through spill over and multiplier effects in terms of maintaining production and employment, generation of market fees, taxes etc. and net acceleration to economic growth; and

v) streamline loss assessment procedures and help in building up huge and accurate statistical base for crop production.

Salient Features of the Scheme

Crops Covered

The crops in the following broad groups in respect of which (a) the past yield data based on Crop Cutting Experiments (CCEs) is available for adequate number of years and (b) requisite number of CCEs are conducted for estimating the yield during the proposed season:

1. Food crops (Cereals, Millets and Pulses)
2. Oil seeds
3. Sugarcane, Cotton and Potato (annual commercial /annual horticultural crops)
4. Other annual commercial /annual horticultural crops subject to availability of past yield data will be covered in a period of three years. However, the crops which will be covered during the year will have to be spelt before the close of preceding year.

States and Areas Covered

The Scheme extends to all States and Union Territories. The States /UTs which are opting for the Scheme are required to take up all the crops identified for coverage in a given year.

Exit Clause: The States /Union Territories once opting for the Scheme will have to continue for a minimum period of three years.

13 Source: http://agricoop.nic.in/Credit/MODALITIES.pdf

Farmers Covered

All farmers including sharecroppers and tenant farmers growing the notified crops in the notified areas are eligible for coverage. The Scheme covers following groups of farmers:

A) **On a compulsory basis:** All farmers growing notified crops and availing Seasonal Agricultural Operations (SAO) loans / KCC loans and Jewel loans for the purpose of cultivation of the notified crop, from Financial Institutions (FI), i.e., Loanee Farmers.

B) **On a voluntary basis:** All other farmers growing notified crops (i.e., Non-Loanee farmers) that opt for the Scheme.

Risks Covered and Exclusions

Comprehensive risk insurance will be provided to cover yield losses due to non-preventable risks, viz.:

a) Natural Fire and Lightning
b) Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado, etc.
c) Flood, Inundation and Landslide.
d) Drought and Dry spells
e) Pests / Diseases etc.

Losses arising out of war and nuclear risks, malicious damage and other preventable risks will be excluded.

Sum Insured / Limit of Coverage

The Sum Insured (SI) may extend to the value of the threshold yield of the insured crop at the option of the insured farmers. However, a farmer may also insure his crop beyond the value of threshold yield level up to 150 per cent of average yield of notified area on payment of premium at commercial rates. In case of Loanee farmers the Sum Insured would be at least equal to the amount of crop loan advanced. Further, in case of Loanee farmers, the Insurance Charges will be additionality to the scale of finance for the purpose of obtaining loan. In matters of Crop Loan disbursement procedures, guidelines of RBI / NABARD will be binding.

Premium Rates

Premium rates for different crops to be insured under NAIS are given in Table 1. Transition to the actuarial regime in case of cereals, millets, pulses and oil seeds would be made in a period of five years. The actuarial rates will be applied at District /Region / State level at the option of the State Government / Union Territory.

Table 1: Premium Rates under NAIS

S. No.	Season	Crops	Premium rate
1.	Kharif	Bajra and Oilseeds	3.5 per cent of Sum Insured or Actuarial rate, whichever is less.
		Other crops (cereals, other millets and pulses)	2.5 per cent of Sum Insured or Actuarial rate, whichever is less.
2.	Rabi	Wheat	1.5 per cent of Sum Insured or Actuarial rate, whichever is less
		Other crops (other cereals, millets, pulses and oilseeds)	2.0 per cent of Sum Insured or Actuarial rate, whichever is less
3.	Kharif and Rabi	Annual Commercial / Annual Horticultural crops	Actuarial rates.

Premium Subsidy

Fifty per cent subsidy in premium in case of loanee farmers and 55 per cent in case of non-loanee farmers are allowed in respect of small and marginal farmers, to be shared by the Government of India (5 per cent) and the concerned State / Union Territory (UT) Government (45 per cent). The premium subsidy was required to be phased out on sunset basis in a period of three to five years subject to the review of financial results and the response of farmers at the end of the first year of the implementation of the Scheme.

The definition of Small and Marginal farmer are as follows:

- Small Farmer:A cultivator with a land holding of 2 hectares (5 acres) or less, as defined in the land ceiling legislation of the concerned State /UT.
- Marginal Farmer:A cultivator with a land holding of 1 hectare (2.5 acres) or less.

Sharing of Risk

Risk is shared by Implementing Agency (IA) and the Government in the following manner:

Food Crops and Oilseeds: Until complete transition to actuarial regime in a period of five years takes place, claims beyond 100 per cent of premium will be borne by the Government. Thereafter, all normal claims, i.e., claims up to 150 per cent of premium will be met by IA and claims beyond 150 per cent will be paid out of Corpus Fund for a period of three years. After this period of three years, claims up to 200 per cent will be met by IA and above this ceiling, out of the Corpus Fund.

Annual Commercial Crops / Annual Horticultural Crops: Implementing Agency will bear all normal losses, i.e., claims up to 150 per cent of premium in the first three years and 200 per cent of premium thereafter subject to satisfactory claims experience. The claims beyond 150 per cent of premium in the first three years and 200 per cent of premium thereafter will be paid out of Corpus Fund. However, the period of three years stipulated for this purpose will be reviewed on the basis of financial results after the first year of implementation and the period will be extended to five years, if considered necessary.

To meet catastrophic losses, a Corpus Fund will be created with contributions from the Government of India and State Government / UT on 50:50 basis. A portion of Calamity Relief Fund (CRF) will be used for contribution to the Corpus Fund. The Corpus Fund will be managed by Implementing Agency (IA).

Area Approach and Unit of Insurance

The Scheme would operate on the basis of 'Area Approach' i.e., Defined Areas for each notified crop for widespread calamities and on an individual basis for localized calamities such as hailstorm, landslide, cyclone and flood. The Defined Area (i.e., unit area of insurance) may be a Gram Panchayat, Mandal, Hobli, Circle, Firka, Block, Taluka etc. to be decided by the State / UTGovt. However, each participating State / UT Government is required to reach the level of Gram Panchayat as the unit in a maximum period of three years. Only Andhra Pradesh has succeeded in this endeavor so far.

Individual based assessment in case of localized calamities, to begin with, would be implemented in limited areas on experimental basis, initially and will be extended in the light of operational experience gained. The District Revenue administration will assist the Implementing Agency in assessing the extent of loss.

Seasonality Discipline

The broad seasonality discipline followed for Loanee farmers are as under:

Table 2: Cut –Off Dates Fixed for NAIS

Activity	Kharif	Rabi
Loaning period	April to September	October to Next March
Cut-off date for receipt of Declarations	November	May
Cut-off date for receipt of yield data	January / March	July/ September

The broad cut-off dates for receipt of proposals in respect of Non-Loanee farmers will be as under:
Kharif season: 31st July
Rabi season: 31st December
However, seasonality discipline may be modified, if and where necessary in consultation with State /UT and the Govt. of India.

Estimation of Crop Yield

The State / UT Govt. plan and conduct the requisite number of Crop Cutting Experi¬ments (CCEs) for all notified crops in the notified insurance units in order to assess the crop yield.

The State / UT Govt. is required to maintain a single series of Crop Cutting Experiments (CCEs) and re-

sultant yield estimates, both for Crop Production estimates and Crop Insurance. Crop Cutting Experiments (CCEs) will be undertaken per unit area / percrop, on a sliding scale, as indicated below:

A Technical Advisory Committee (TAC) comprising representatives from National Sample Survey Organization (NSSO), Ministry of Agriculture (MoA) (Government of India) and Implementing Agency (IA) will be constituted at national level to decide the sample size of CCEs and all other technical matters pertaining to threshold yield / actual yield, etc. The number of CCEs to be conducted is given in Table 9.

Table 3: Number of Crop Cutting Experiments to be Conducted under NAIS

S. No.	Unit Area	Minimum number of C.C.Es Required to be Done
1.	Taluka/ Tehsil / Block	16
2.	Mandal / Hobli/Firka / any other smaller unit area comprising 8 - 10 villages	10
3.	Gram Panchayat comprising 4-5 villages	08

The yield data is furnished to IA by the State Government /UT in accordance with the cut-off dates fixed for all crops and areas notified, based on the total number of Crop Cutting Experiments (being not less than the minimum prescribed) conducted. The standard procedures for assessing the yield in respect of multiple picking crops is prepared by IA in consultation with the National Sample Survey Organization (NSSO) and circulated among implementing States /Union Territories.

A Committee comprising representatives of State / UTGovernment, National Sample Survey Organization (NSSO) and IA is required to be set up at the State level to monitor /supervise and advice in matters relating to adequacy and quality of CCEs.

Loss Assessment in Case of Localized Calamities

Loss assessment and modified indemnity procedures in case of occurrence of localized perils, viz., hailstorm, landslide, cyclone and floods, where settlement of claims will be formulated by IA in coordination with the concerned State / Union Territory. Settlement of such claims will be on individual basis between IA and insured. This procedure will be experimented in two districts and will be extended to other areas in the light of operational experience gained. The insured farmers who experience crop losses due to occurrence of these localized perils will give immediate notice to the financial institution / notified office of IA and in any case within 48 hours along with particulars of crop insured and extent and cause of damage.

On receipt of loss the intimation, IA will depute Loss Assessors to the area for assessment of crop loss. The District Revenue administration will assist IA in assessing the extent of crop loss.

IA will also develop Loss Adjuster Cadre and for this purpose a few Officers will be trained in loss assessment procedures. The services of unemployed Agricultural Graduates and retired Agricultural Department Officials may also be utilized for loss assessment after imparting initial training.

Levels of Indemnity and Threshold Yield

Three levels of indemnity, viz., 90 per cent, 80 per cent and 60 per cent corresponding to Low Risk, Medium Risk and High Risk areas will be available for all crops (cereals, millets, pulses and oilseeds and annual commercial /annual horticultural crops) based on Coefficient of Variation (C.V) in yield of past 10 years' data. However, the insured farmers of unit area mayopt for higher level of indemnity on payment of additional premium based on actuarial rates.

The Threshold Yield (TY) or Guaranteed Yield for a crop in an Insurance Unit is the moving average based on past three years' average yield in case of rice and wheat and five years' average yield in case of other crops, multiplied by the level of indemnity.

Nature of Coverage and Indemnity

If the 'Actual Yield' (AY) per hectare of the insured crop for the defined area [on the basis of requisite number of Crop Cutting Experiments (CCEs)] in the insured season, falls short of the specified

'Threshold Yield' (TY), all the insured farmers growing that crop in the defined area are deemed to have suffered shortfall in their yield. The Scheme seeks to provide coverage against such contingency.

'Indemnity' is calculated as per the following formula:

(Shortfall in Yield /Threshold yield) × Sum Insured for the farmer.
{Shortfall in Yield = Threshold Yield - Actual Yield for the Defined Area}

Once the Yield Data is received from the State / Union Territory Government as per the prescribed cut-off dates, claims are worked out and settled by IA.

Implementing Agencies (IA)

An exclusive organization AICIL has been set up for implementation of RKBY. Till AICIL took over the RKBY, the 'G.I.C. of India' used to function as the Implementing Agency.

Reinsurance Cover

Efforts are required to be made by IA to obtain appropriate reinsurance cover for the proposed RKBY in the international Reinsurance market.

Operational Modalities

A 'State Level Coordination Committee on Crop Insurance' (SLCCCI) is formed in all the implementing States / UTs for the purpose of overseeing imple¬mentation of the Scheme, headed by the Agricultural Production Commissioner (APC) or by an Official of equal rank of the State and includes senior officers of the State, viz., Secretary (Agriculture), Secretary (Co-operation), Secretary (Finance), Director, Bureau of Statistics and Economics, Registrar of Co-operative Societ¬ies, representative of Ministry of Agriculture, Financial Institutions including NABARD, RBI, State Apex Co-operative Bank, Convener, State Level Bankers' Committee (SLBC) and Implementing Agency (IA).

Notification

At the beginning of each crop season, the State Government / UT administration notifies the Crops and Defined Areas to be covered during the season in accordance with the decision taken at the SLCCCI meeting.

The State Government /UT should notify the smallest possible units as defined areas (i.e., insurance units), which is preferably, the Village or the Gram Panchayat. In any case, the States /UTs will reach the level of Gram Panchayat within three years.

Collection of Proposal and Insurance Charges

The present Nodal Banks system under CCIS continues for NAIS (RKBY) as well, wherein IA is not required to deal with all the loan disbursing points and instead, deals only with designated Nodal points, mostly at district level.

Loanee Farmers (Compulsory Coverage)

For loanee farmers, the modalities will be the same as in the existing CCIS. A farmer opting for Sum Insured higher than the amount of loan availed by him will be treated at par with non-loanee farmer and relevant cut-off dates for submitting declarations apply. Further, a farmer may also insure his crop beyond value of threshold yield up to 150 per cent of average yield of notified area on payment of premium for balance sum insured at commercial rates.

In respect of loanee farmers availing sum insured beyond amount of loan availed, the details of those farmers availing sum insured beyond value of threshold yield will be furnished separately in a schedule in the Declaration.

Non-Loanee Farmers (Optional Coverage)

Those farmers desirous of joining the Scheme fill up Proposal Form of the Scheme and submit the same to the village branch of a Commercial Bank (CB) or Regional Rural Bank (RRB), or PACS (DCCB) with the requisite insurance charge / premium amount after opening an Account in their name or in an existing Account in their name.

The Nodal Banks in turn submit to the IA the Crop-wise and Notified Area-wise Crop Insurance Declarations in the prescribed format, (separately for non-loanee farmers) along with the Insurance Charges / Premium, within the stipulated time.

In respect ofoptional coverage (non-loanee farmers), the entire amount of insurance charges /premium on the basis of the proposal of the farmer are deposited with the Branch / PACS within the stipulated dates and in turn, banks consolidate, prepare a Declaration and forward the same to IA with premium.

Receipt of Proposals Directly from Non – Loanee Farmers

On an experimental basis, (subject to infrastructure of IA), non-loanee farmers may submit proposals personally to IA with requisite insurance charges / premium. The IA will then consolidate these proposals and convert them into Declarations. However, it is mandatory that non-loanee farmers personally submitting proposals to IA should hold a bank account in the service area /designated bank branch to receive compensation, if any.

Option for Higher Sum Insured

Food Crops and Oilseeds: Sum Insured is worked out by multiplying the threshold yield of the crop with Minimum Support Price (MSP) or the market price (where MSP is not available) in respect of previous year. A farmer is eligible to cover up to the value of threshold yield of the crop at a given premium rate. Additionally, a farmer may extend the sum insured up to 150 per cent of the value of the average yield of the crop on payment of premium at Commercial (actuarial) rate for the part of the sum insured exceeding value of threshold yield.

Annual Commercial / Horticultural Crops: Sum insured may extend up to 150 per cent of the value of average yield of the crop at commercial (actuarial) rate for the entire sum insured. In case of Loanee farmers, the minimum sum insured is the amount of loan availed.

Seasonality Discipline - Submission of Declarations by Banks

Loanee Farmers

Banks will send to IA every month consolidated Crop Insurance Declarations in respect of loan disbursed to the loanee farmers for each crop and each Defined Area. The details of SAO loans disbursed for insurable crops during a month will be declared to IA in the form of consolidated Declarations before the end of the succeeding month.

Those loanee farmers who would like to avail a sum insured of more than the amount of loan availed will indicate their choice to the Financial Institutions at the beginning of the season and for these farmers, the cut-off dates will be those applicable for Non-Loanee farmers.

Non-Loanee Farmers

The broad Cut-Off dates for receipt of Proposals by the Banks / IA, in respect of these farmers will be: (a) Kharif season: 31st July and (b) Rabi season: 31st December

In respect of these farmers, the last date of receipt of the consolidated proposals at IA, will be one month after the last date for receipt of proposals at the Nodal Branch. However, within these broad parameters suggested above for all categories of farmers, the seasonality discipline may be modified in consultation with State / UT Government and Government of India, depending on local conditions and crop season.

Important Conditions Applicable for Coverage of Risk

a) Loans given for unsown areas will not be covered by the Scheme, because, indemnity claims will arise under the Scheme, only after the crop has been sown and in the event of crop failure. Mere disbursement of loans by the financial institutions /submission of Pro¬posal by a Non-Loanee farmer will not entitle him for compensation under the Scheme.

b) In the areas where crop is sown but, withered away / damagedon account of adverse seasonal conditions /pest and / or diseases and also where there is no possibility of reviving the crop, no further loaning should be made by the financing institutions. Any further loaning in such cases will not be covered by the Scheme.

c) The Scheme covers notified crops until harvesting stage only. Losses caused to crops

which are spread in the field for drying after cutting /harvesting are excluded from the scope of the Scheme.

Procedure of Settlement of Claims

Once the yield data is received from the State Government as per the cut-off-dates decided, the claims are worked out as per Declarations received from FIs for each notified area and approval is obtained. Loss assessment and modified indemnity procedures in case of occurrence of localized perils, such as hailstorm, landslide, cyclone and flood where settlement of claims will be on individual basis, will be formulated by IA in consultation with State /U.T. Government. (Important: In case of Loanee farmers' full amount of loan is eligible for normal rates irrespective of the value of TY and / or AY).

Claims Approval: Claims will be approved by IA. However, the Government may at their option, scrutinize / examine a claim falling within their risk liability. Disputed claims /sub-standard claims, if any, will be referred to a Committee consisting of representatives of Ministry of Agriculture (GOI), concerned State Government and Insurance Agency.

Settlement / release of claims in the States / UTs which exceed set risk sharing limits of IA will be subject to receipt of funds from the Government.

Publicity / Awareness and Review

This Scheme requires adequate publicity in all the villages of the notified district. Besides audio-visual media, the services of Agricultural Extension Officers of the State /UT should be utilized. It is equally important to train people who are going to be involved in collection of premium, processing of Declarations, Proposal forms etc. in banks to avoid any confusion and misunderstanding. Training programmes and workshops, visit of IA Officers to the banks will help in clarifying the doubts, redressal of grievances and clearing bottlenecks in smooth implementation of the Scheme. Pamphlets will be distributed to all villages in participating States / UTs. A short film covering the salient features of the Scheme will be made by the IA for this purpose.

General

The FIs will be paid, service charges @ 2.5 per cent of the premium collected in respect of both loanee and non-loanee farmers at the end of the season.

Correct premium rates should be ascertained from the Notification issued by IA and premium computation (Sum insured × Premium rate) should be done accurately. In respect of Small and Marginal farmers (i.e., farmers with a land holding of less than 2 hectares) only net premium (full premium less subsidy) need to be remitted. Remission of excess premium will not entitle for increase in sum insured / liability, at a later date.

Nodal banks must ensure coverage of all crop loans and shall obtain full and accurate particulars from all the FIs within their jurisdiction. They must ensure coverage of proposals received from all non-loanee farmers within their jurisdiction as per prescribed cut–off dates.

Claims under this scheme will be settled only on the basis of yield data furnished by the Directorate of Economics and Statistics arrived at through regular crop estimation surveys for production estimates (i.e., planned Crop Cutting Estimates) and not on any other basis such as Annawari, declaration of drought, declaration of floods, Gazette notification, etc. by any Department / Authority.

Annexure 4: Key Statistics for Growth and Outreach of Weather Index Insurance in India[14]

Pre-WBCIS (2003-2006) Statistics

Farmers Insured

ICICI Lombard and IFFCO-Tokio witnessed decent rise in the numbers of customers (farmers insured under weather insurance) during 2003-07. During this period both companies managed to increase their customer base by 20 times. The year 2005-06 witnessed the highest growth in terms of numbers for ICICI Lombard whose customer base rose to 87,000 during 2005-06 from 8,000 in 2004-05, signifying a growth of almost 10 times. IFFCO-Tokio saw its highest growth in 2006-07 (customers increased to 73,900 in 2006-07 from 25,500 in 2005-06). However, the spurt in growth could not be sustained in following years, and both companies faced decline in customer base.

	ICICI Lombard	IFFCO-Tokio
2003-04	1000	
2004-05	8000	3300
2005-06	87000	25500
2006-07	108000	73900
2007-08	43278	68908

Farmers Benefitted

ICICI Lombard provided claim benefits to nearly 90% and 60% of farmers insured in 2003-04 and 2004-05, the first two years of its weather insurance launch; however the claim benefit percentage declined sharply during following years. In 2005-06, 2006-07 and 2007-08 the claims benefits were only 4%, 5% and 18% respectively.On the other hand, the claim benefits provided by IFFCO-Tokio have been in the range of 1% to 8% during 2004-07.

	ICICI Lombard	IFFCO-Tokio
2003-04	900	-
2004-05	4,800	22
2005-06	4,951	1,022
2006-07	5,480	5,980

Total Premiums

From a negligible premium amount in 2003-04, the cumulative premiums of weather insurance in India rose to a spectacular 72 million rupees in a period of only two years. After an increase of almost seven times in cumulative premiums from 2004-05 to 2005-06, the cumulative premiums stagnated in 2006-07. Amid an inconsistent trend in growth of premiums by AIC, ICICI Lombard and IFFCO-Tokio were able to steadily increase their premiums.

	AIC	ICICI Lombard	IFFCO-Tokio
2003-04	-	0.02	-
2004-05	0.6	4.7	4.5
2005-06	32.3	16.1	24.6
2006-07	19.0	26.0	26.0

Total Claims

The following table depicts the claim amounts made by the three insurers during the period 2003-04 to 2006-07.

	AIC	ICICI Lombard	IFFCO-Tokio
2003-04	-	0.03	-
2004-05	0.6	3.1	0.03
2005-06	2.4	3.0	2.1
2006-07	14.1	17.1	13.1

14 Source: Data collected from Insurance Companies as part of the Evaluation Study of Pilot Weather Based Crop Insurance Scheme' commissioned in 2010 by the Ministry of Agriculture & Cooperation, Government of India

*Only Kharif Season Claims
Claims Ratio

Till 2006-07, ICICI Lombard has witnessed the highest claims ratio among the three insurers offering weather insurance in India, exceeding 66% in three out of the four years of its weather insurance operation. Except for the 2005-06 MY, when all the three competing insurers saw claims ratio lower than 20%, the weather insurance portfolio of AIC has also exhibited claims ratio exceeding 70%. The claims ratio of IFFCO-Tokio has increased from a meager 1% in 2004-05 to 50% in 2006-07.

Post-WBCIS Statistics

Farmers Insured under WBCIS

AIC is the leader in providing weather based crop insurance in India followed by ICICI Lombard. IFFCO-Tokio has a marginal share of the market for weather based crop insurance leaving the competition open for AIC and ICICI Lombard. There has been a phenomenal rise in the farmers insured by AIC under WBCIS, from around 44 thousand in Kharif 2007 to over 165 thousand farmers in the Kharif 2008 season. The biggest jump in coverage occurred in the Kharif 2009 agricultural season with AIC's weather insurance policies covering more than 1.1 million farmers across India. ICICI-Lombard's coverage of farmers has witnessed a modest rise till Rabi 2009-10 when it leapfrogged to more than 10 times the farmers insured in any of the preceding seasons under WBCIS.

	AIC	ICICI Lombard	IFFCO-Tokio
Kharif 2007	43,790	-	-
Rabi 2007-08	627,167	7,468	-
Kharif 2008	165,199	18,359	13
Rabi 2008-09	169,973	23,229	435
Kharif 2009	1,133,975	26,642	194
Rabi 2009-10	869,829	245,384	-

Farmers Benefitted under WBCIS

In terms of the number of farmers benefitting from WBCIS by way of claims, AIC has led its private sector counterparts by a fair margin, till the Kharif 2009 season. For WBCIS coverage by AIC during Kharif 2009, nearly 80 per cent of the farmers insured received payouts while for ICICI Lombard this figure stood at around 50 per cent. None of the farmers insured by IFFCO-Tokio benefitted from claims during Kharif 2009 season. Kharif 2009 saw country-wide droughts or drought like situations, the worst during the last 27 years. Irrespective of the superiority of product design, claim benefits during seasons like Kharif 2009 are crucial for reinforcing the value farmers would ascribe to WBCIS or weather insurance product.

	AIC	ICICI Lombard	IFFCO-Tokio
Kharif 2007	35,275	-	-
Rabi 2007-08	187,790	4,937	-
Kharif 2008	104,483	4,479	13
Rabi 2008-09	112,001	8,343	433
Kharif 2009	888,210	13,539	0

Total Premiums under WBCIS

In terms of the premium collections, AIC takes up the largest chunk of premium collections pie owing to its higher share of farmers insured. During Kharif 2009 season, the total premium collected by ICICI Lombard is less than ten per cent of the total premium collected by AIC while the premium collection of IFFCO-Tokio is abysmally low at Rs 0.3 million. ICICI Lombard has managed to narrow the gap in WBCIS premiums between it and AIC by reaching a premium level of almost 50% of the premiums earned by AIC during Rabi 2009-10.

(in INR million)	AIC	ICICI Lombard	IFFCO-Tokio
Kharif 2007	70	-	-
Rabi 2007-08	1,384	32	-
Kharif 2008	317	49.4	0.3
Rabi 2008-09	359	109	3.6
Kharif 2009	1,989	144	3
Rabi 2009-10	1,611	799	-
Kharif 2010	4,547	3,321	527
Rabi 2010-11	4,281		
Kharif 2011	8,370	3,176	-
Rabi 2011-12	5,642		

Total Claims under WBCIS

The claims data from the three insurers shows a skewed distribution. AIC has the highest average claims ratio (claims to premium collected) vis-à-vis ICICI Lombard and IFFCO-TOKIO (Table). During Kharif 2009 which was the worst year (over the last three years of evaluation) in terms of moisture stress (water stress arising out of drought or drought like situations), the claims to premium ratio for AIC was at a high level of 81 per cent compared to 36 per cent for ICICI Lombard and zero per cent for IFFCO-TOKIO.

	AIC	ICICI Lombard	IFFCO-Tokio
Kharif 2007	52	-	-
Rabi 2007-08	1,007	15	-
Kharif 2008	144	16.5	0.03
Rabi 2008-09	261	73	0.12
Kharif 2009	1,612	47	0
Rabi 2009-10	1,336	528	-

Over the first five seasons of its WBCIS experience, AIC has been able to provide claim benefit to nearly 62% (cumulative across all seasons) of the farmers insured by it. The overall claims ratio of AIC is nearly 77% which indicates that out of every 100 rupees of premium received by it, it has paid out an average of 77 rupees across the six seasons of its WBCIS coverage. The corresponding percentage of farmers benefitted for ICICI Lombard is 41% while its overall claim ratio during five seasons of its WBCIS participation has been 60%.

Of the six seasons of WBCIS coverage, including Rabi 2009-10, the one season where the ability of weather insurance to pay claims faced its toughest test was the Kharif 2009 season. This season was claimed to be the worst in the last 27 years and had widespread impact across India. Western India, particularly Rajasthan, suffered badly from drought and had to look upon relief from State and Central governments. Rajasthan, coincidentally, has been one of the foremost states in adoption of WBCIS. The claim ratios of the leading insurers, AIC and ICICI Lombard for Rajasthan during the Kharif 2009 season were 98% and 34% respectively. Except the conspicuous Kharif season, ICICI Lombard has fared well in terms of claims payment. Its claim ratio for the latest Rabi 2009-10 is 66% compared to 82% (approx.) for AIC.

Premium Subsidy under WBCIS

The premium subsidy under WBCIS has ranged from 80% to 65% indicating a high incentive for farmers to undertake trials of weather insurance. The slight difference between the premiums subsidy provided may be purely co-incidental.

	AIC	ICICI Lombard
Kharif 2007	80%	
Rabi 2007-08	69%	73%
Kharif 2008	74%	71%
Rabi 2008-09	76%	74%
Kharif 2009	71%	68%

Annexure 5: Examples of Deficient Rainfall Index Structures Commonly Used in India

Based on Normal/Average Seasonal Rainfall

Rainfall Range (in MM)	Payment (INR/MM)
0-42	21.1
42-85	21
85-128	20.93
128-170	20.87
170-213	20.78
213-256	20.65
256-298	20.56
298-341	20.45
341-384	20.4
384-426	20.35
426-469	18.3
469-512	16.47
512-554	14.8
554-597	13.32
597-640	11.99
640-682	10.77

Based on Weighted Rainfall Index

Month	Weight	Normal Rainfall (mm)	Weighted Rainfall
June	1.25	114.7	143.4
July	1.50	205.1	307.7
August	1.25	178.4	223.0
September	0.50	186.3	93.2
Total	-	569.8	767.2

Claim Payout Table	% Deficiency	Payout (% of Sum Assured)	
	0%	0%	
	10%	0%	
	30%	10%	
	40%	13%	
	50%	18%	
	60%	25%	
	70%	40%	
	80%	70%	
	90%	100%	
Premium (%)		4.38	

Based on Phase-wise Rainfall Index Derived from Crop Growth Requirements

Phase	Dates	Strike (mm)	Exit (mm)	Sum Assured (INR)
Establishment and Vegetative Growth	June 10 – July 14	75	20	3,000
Flowering and Pod Formation	July 15 – August 28	110	40	2,000
Pod Filling and Maturity	August 29 – October 2	75	10	1,000

Based on Consecutive Dry Days Index

Cover Period	1-Jul to 31-Aug		
Dry Day Definition	Daily Rainfall ≤ 2.5 mm		
Trigger Dry Days (>=)	17	25	30
Payout (INR)	750	1500	2000

Annexure 6: Description of an Actual Rainfall Index Insurance Product Used in Gujarat

Groundnut Weather Index Insurance for Junagadh

1. Sowing and Germination Failure Cover

The purpose of the cover is to compensate groundnut growers for lack of critical rainfall required for sowing, deficient rainfall for germination, and excess rainfall during germination period.

A) Sowing Failure

The critical value required for sowing has been fixed as minimum 65 mm of rainfall over any three consecutive days (starting from preceding 2 days) during the period 11th June to 10th July (sowing window). The attainment of the critical rainfall for sowing has been denoted as the sowing trigger for the subsequent crop stages.

The indemnity accruing to each groundnut farmer covered for this peril would be calculated on the basis of rainfall values for three consecutive days (which will be computed for all days during the period of this cover). The deviation unit for this cover is defined as the amount of actual rainfall (in mm) falling below the critical sowing rainfall value of 65 mm over three consecutive days.

Payment to groundnut growers would occur if the maximum rainfall value (for three consecutive days) computed over the period of this cover is less than the critical rainfall value of 65 mm required for sowing. 100% payment under this cover would be made if maximum rainfall value (for three consecutive days) during the period of cover is less than 40 mm. It may, however, be noted that the total payout made under this cover would not, in any case, exceed the Maximum Sum Assured.

The payout structure would be based on the following slabs for a standard sum assured of Rs 100:

Sowing Failure Payout Structure

Actual Rainfall (mm)	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm deficit)
Range 1	65	40	25	3
Range 2	40 & less		100	

B) Germination Failure due to Deficient Rainfall

The period of germination has been defined as the 14-day period immediately following two consecutive days of rainfall less than 5 mm per day after the date of sowing trigger.
The indemnity accruing to each groundnut farmer covered for this peril would be calculated on the basis of cumulative rainfall during the period of germination.

Payment to groundnut growers would occur if the cumulative rainfall during the germination period is less than 40 mm. 100% payment under this cover would be made if cumulative rainfall during the germination period is 20 mm or less. It may, however, be noted that the total payout made under this cover would not, in any case, exceed the Maximum Sum Assured.

The payout structure would be based on the following slabs for a standard sum assured of Rs 100:

Germination Failure due to Deficient Rainfall Payout Structure

Actual Rainfall (mm)	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm deficit)
Range 1	40	20	10	4.5
Range 2	20 & less		100	

C) Germination Failure due to Excess Rainfall

Any excess rainfall during germination period is also being insured under the sowing and germination failure cover. Germination period for groundnut is defined as a 14-day period which begins after occurrence of two consecutive days of less than 5 mm daily rainfall following the sowing trigger.

The rainfall limits for excess rainfall event to be considered under this cover are provided in the following table:

i. **Rainfall of more than 100 mm on any day during the germination period**
ii. **Cumulative rainfall of more than 100 mm on two consecutive days during the germination period**

Any rainfall above the rainfall limits defined above will be deemed as excess rainfall. The indemnity accruing to each groundnut farmer would be calculated on the basis of excess rainfall accumulated during the period of germination.

Payment to groundnut growers would occur if the excess rainfall during the germination period is more than 30 mm. 100% payment under this cover would be made if the excess rainfall during the germination period is more than 120 mm. It may, however, be noted that the total payout made under this cover would not, in any case, exceed the Maximum Sum Assured.

The payout structure would be based on the following slabs for a standard sum assured of Rs 100:

Germination Failure due to Excess Rainfall Payout Structure

Actual Excess Rainfall (mm)	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm excess)
Range 1	30	120	10	1
Range 2	120 & more		100	

D) Combined Sowing and Germination Failure Cover

The payouts accruing from each of the three perils namely:

i. Lack of rainfall for sowing
ii. Germination failure due to deficient rainfall
iii. Germination failure due to excess rainfall

will be compared and the highest payout among the two would be provided as indemnity against sowing failure, and germination failure due to excess rainfall.

2. Deficient Rainfall Cover

The purpose of the cover is to compensate the groundnut growers for losses arising due to deficient rainfall for the crop stages after germination.

The cover is being provided for three crop stages, namely vegetative growth, flowering, and boll development. Vegetative growth stage is deemed to begin from the day following the last (10th) day of the germination period of groundnut.

For the purpose of computation, daily level rainfall has been pegged at a minimum daily floor of 3 mm. Any rainfall less than 3 mm per day will be regarded as zero for further computation of further rainfall basis/index. Daily level rainfall is then aggregated under non-overlapping periods of differing durations depending on the crop stages for groundnut.

Crop Stage	Aggregation Period	No. of Aggregation Periods
Vegetative Growth	15 Days	2
Flowering & Pod Development	30 Days	1

The indemnity arising to each groundnut farmer covered under this peril would be calculated on the basis of rainfall index. The rainfall index for a crop stage is the sum of the daily rainfall (after ignoring daily rainfall less than 3 mm) taking place during one or more aggregation period(s) falling under the given crop stage.

Vegetative Growth Stage

In order to further improve the quality of the rainfall index and ensuring a better distribution of rainfall,

a "capping" procedure has been introduced during the vegetative growth stage taking into account the fact that water in excess of storage capacity is lost and does not contribute to plant growth. Rainfall during any of the two aggregation periods (15-day period) has been capped at 30 mm which means that rainfall greater than 30 mm in a decade will still be treated as 30 mm for computation of rainfall index. The rainfall index for the vegetative growth stage is computed by taking the sum of the rainfall during the two aggregation periods of 15 days each, subject to the cap of 30 mm per aggregation period of 15 days.

Payment to groundnut growers would occur if the rainfall index for the vegetative growth stage is less than 50. 100% payment for the vegetative growth stage would be made if the rainfall index is less than 20. It may, however, be noted that the total payout made under the vegetative growth stage would not, in any case, exceed the Maximum Sum Assured for this stage.

The payout structure for vegetative growth stage would be based on the following slabs for a standard sum assured of Rs 100:

Payout Structure for Deficient Rainfall Cover – Vegetative Growth Stage

Rainfall Index	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm deficit)
Range 1	50	40	10	2
Range 2	40	20	30	3.5
Range 3	20 & less		100	

Flowering & Pod Development Stage

Payment to groundnut growers would occur if the rainfall index for the flowering & pod development stage is less than 35. 100% payment for the flowering & pod development stage would be made if the rainfall index is less than 5. It may, however, be noted that the total payout made under the flowering stage would not, in any case, exceed the Maximum Sum Assured for this stage.

The payout structure for flowering stage would be based on the following slabs for a standard sum assured of Rs 100:

Payout Structure for Deficient Rainfall Cover – Flowering & Pod Development Stage

Rainfall Index	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm deficit)
Range 1	35	5	10	3
Range 2	5 & less		100	

3. Excess Rainfall Cover

The purpose of the cover is to compensate the groundnut growers for losses arising due to excess rainfall during the period starting from the day following the last (14th) day of the germination period of groundnut. The cover is provided into three stages, each representing varying level of sensitivity to excess rainfall.

Stage	Duration (Starting from the day following the last day of germination period)
Stage I	45 days
Stage II	30 days
Stage III	30 days

The rainfall limits for excess rainfall event to be considered under different stages of this cover are indicated below:

Peril	1-day ER* Limit (in mm)	2-day ER* Limit (in mm)
Stage I	150	250
Stage II	75	125
Stage III	45	60

*ER – Excess Rainfall

For simplicity in understanding, the ER (Excess Rainfall) Limits can be interpreted through the following illustrations. Based on the above limits, excess rainfall event will be considered in the following cases.

i. **Rainfall of more than 45 mm on any day during Stage III**

ii. **Cumulative rainfall of more than 60 mm on two consecutive days during Stage III**

iii. **Cumulative Rainfall of more than 125 mm on two consecutive days during Stage II**

iv. **Rainfall of more than 150 mm on any day during Stage I**

Any rainfall above the rainfall limits defined in the previous table will be deemed as excess rainfall. The indemnity accruing to each groundnut farmer would be calculated on the basis of excess rainfall accumulated during the entire period of excess rainfall cover (total 105 days).

Payment to groundnut growers would occur if the excess rainfall during the cover period (105 days) is more than 100 mm. 100% payment under this cover would be made if cumulative excess rainfall during the period of cover is 200 mm or more. It may, however, be noted that the total payout made under this cover would not, in any case, exceed the Maximum Sum Assured.

The payout structure would be based on the following slabs for a standard sum assured of Rs 100:

Excess Rainfall Payout Structure

Cumulative Excess Rainfall (mm)	Limit 1	Limit 2	Fixed Payout (Rs)	Variable Payout (Rs) (per mm excess)
Range 1	100	200	25	0.75
Range 2	200 & more		100	

4. Summary for Groundnut Weather Insurance Product for Junagadh, State – Gujarat

Cover	Maximum Sum Assured (Rs.)
Sowing & Germination Failure	1500
Deficient Rainfall – Vegetative Growth	2000
Deficient Rainfall – Flowering & Pod Development	2000
Excess Rainfall	2000

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