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Sidharth Sinha

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Agriculture Insurance in India

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I am responsible for views expressed in this paper.

Abstract

Government run crop yield insurance scheme, procurement at minimum support prices and calamity relief funds are the major instruments being used to protect the Indian farmer from agricultural variability. However, crop insurance covers only about 10% of sown area and suffers from an adverse claims to premium. There are problems with both the design and delivery of crop insurance schemes. These problems could be overcome with rainfall insurance with a well developed rainfall measurement infrastructure. Private and public insurers are currently experimenting with rainfall insurance products. Given the current levels of yield and rainfall variability the actuarially fair premium rates are likely to be high and in many cases unattractive or unaffordable. Instead of adopting the easy and unsustainable route of large subsidies, in the long term the government should consider risk mitigation through improvements in the irrigation and water management infrastructure.

Agriculture Insurance in India

Sidharth Sinha²

The need to protect farmers from agriculture variability has been a continuing concern of agriculture policy. According to the National Agriculture Policy (NAP) 2000, “Despite technological and economic advancements, the condition of farmers continues to be unstable due to natural calamities and price fluctuations”. The impact of this variability is highlighted in drought years with news of farmer suicides in many parts of the country. In India crop insurance is one of the instruments for protecting farmers from agricultural variability. Other instruments include open market operations at minimum support prices (MSP) and Calamity Relief Funds. This paper focuses on the use of agriculture insurance schemes to protect farmers from agricultural variability.

In India crop insurance has been subsidized by the central and state governments, managed by the General Insurance Corporation (GIC) and delivered through rural financial institutions, usually tied to crop loans. The government has now established a separate Agriculture Insurance Company with capital participation of GIC, the four public sector general insurance companies, and NABARD. Insurance policies so far have provided crop *yield* insurance. This year pilot programmes are being launched to provide crop *income* insurance. Recently private insurers and the newly formed government Agriculture Insurance Company have executed pilot projects to sell rainfall insurance to farmers, as a substitute for, or complement to crop insurance provided by the government. Some of these initiatives may be partly motivated by the Insurance Regulatory and Development Authority (IRDA) requirement for new entrants to provide coverage to rural and social sectors.³

The experience of government supported and subsidized crop insurance and the recent entry of private insurers raise questions about the co-existence of government and private agriculture insurance. One view is that the private sector will be unable to compete with government insurance, given the subsidies and access to the administrative machinery for delivering insurance. An alternative view is that given the less than 10% coverage by government insurance the private sector can carve out a reasonable market for itself based on improved efficiency, better design and superior services. An alternative to public-private competition is public-private partnership in providing agriculture insurance.

The initial Comprehensive Crop Insurance Scheme (CCIS), implemented during the period 1985-1999, and the subsequent National Agriculture Insurance Scheme (NAIS), since

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³ Details of the obligations are in **Appendix 1**

1999-2000, have had low participation rates and high claims to premium ratio. For example, under the NAIS the covered area is only about 10% of Gross cropped area and the claims to premium ratio till Kharif 2002 is about 4.17. This is a paradox since high claims to premium ratio should make the policies attractive for farmers and induce them to buy coverage. The crop insurance schemes suffer from several problems which are endemic to the nature of the product and delivery mechanism. These include problems of timely and reliable yield measurement, timeliness of claims payments, inadequate risk sharing by the implementing agency and the exclusive reliance on rural financial institutions to deliver the product. Given these problems the private sector is unlikely to offer yield insurance, even in partnership with the government.

The weather insurance product essentially offers (area) yield insurance, but with rainfall as the proxy measure of yield. This eliminates the problem of yield measurement. Moreover, once the investment in rainfall data gathering infrastructure has been made it will be possible to ensure the reliability and integrity of the system. Private participation will be possible with appropriate risk sharing between the government and private insurers. The US and Spanish systems provide examples of such private participation. The entry of the private sector can be expected to provide incentives for efficiency and improvements in service quality.

Given the magnitude of agriculture risks - both yield and price - the actuarially fair premium for insurance may not be affordable or attractive for farmers. Government initiatives are necessary to reduce the risks of agriculture through expansion of canal and other surface water irrigation facilities and development of a national integrated market for agricultural products.

This paper is organized as follows:

Section 1 identifies rainfall as the major risk in Indian Agriculture. Farmer's vulnerability to rainfall variability is increased because of inadequate and unreliable irrigation, and lack of well developed and integrated markets for agriculture produce.

Section 2 provides a brief background to the introduction of crop insurance in India. This is important for appreciating the rationale for certain features of the crop insurance schemes.

Section 3 describes the operation of the Comprehensive Crop Insurance Scheme (CCIS) and the National Agricultural Insurance Scheme (NAIS).

Section 4 reviews the performance of the CCIS and the NAIS and identifies the major problems in design and implementation.

Section 5 describes the pilot project on Farm Income Insurance Scheme (FITS) and its relationship to the Minimum Support Price (MSP) based procurement scheme.

Section 6 provides some information on the design of the Calamity Relief Fund and the National Calamity Contingency Fund, and their role in providing support to farmers during drought.

Section 7 describes the rainfall insurance pilot in Mahboobnagar district of Andhra Pradesh and Jhalawar in Rajasthan. It also compares rainfall insurance to crop insurance on some important dimensions.

Section 8 discusses issues in public private-partnerships for providing agriculture insurance. The case of Spain and the US are presented as illustrations.

Section 9 concludes.

1. Risks in Indian Agriculture

Risks in Agriculture can be decomposed into yield risk and price risk.

Yield risk

Rainfall is the major yield risk factor in Indian Agriculture. This is because the irrigation system is inadequate and unreliable.

As of 1998-99 only about 40% of the gross crop area is irrigated (**Appendix 2**). This has increased from about 34% in 1990-91. Both canal and tube-well irrigation is unreliable. Given the poor condition of canal irrigation because of inadequate maintenance and investment, farmers have placed increasing reliance on ground-water.

During the period 1990-99 the share of land under canal irrigation dropped from 37% to 31% while the share irrigated by tube-wells increased from 30%-36%. Tube-well irrigation is subject to the vagaries of erratic and poor quality of power supply by State Electricity Boards. In the long run, the heavily subsidized agriculture power tariffs are unsustainable and, in many parts of the country, with indiscriminate groundwater extraction, the water table has dropped to unsustainable levels.

There are several aspects of rainfall-uncertainty. Other than the variation in the total rainfall during a given period of time, there are significant temporal and spatial variations.

While the annual all-India total rainfall has a coefficient of variation of about 11%, the coefficient of variation of the annual southwest monsoon rainfall ranges from 44% to 10% for each of the meteorological divisions (**Appendix 3**). This implies that rainfall across geographical areas is less than perfectly positively correlated. Therefore, rainfall variability has both a systematic and an unsystematic component. The coefficient of variation is likely to be higher at further levels of geographic disaggregation, with lower correlation across disaggregated geographic areas.

The pattern of rainfall across time is also important since crops require appropriate rainfall during critical periods in the crop cycle. The variability of rainfall over short time horizons is significantly greater than over longer time horizons. For example, the coefficient of variation of monthly rainfall ranges from 68% for December to 12% for July (**Appendix 4**).

Weather also plays a significant role in the development of diseases and growth of pests. However, the relationship between various aspects of the weather, such as rainfall, temperature and humidity is complex and specific to the pest, crop, soil and management practices (Ramaswami 2003)⁴.

⁴ "Risk Management in Agriculture", Bharat Ramaswami, Shamika Ravi, S.D. Chopra, June 2003, Discussion Paper 03-08, Indian Statistical Unit, Delhi

According to the Economic Survey 2002-03, low rainfall years in the past have always adversely affected kharif crop production. The magnitude of decline in production has varied depending upon the severity of the drought. The current year's fall of 19.1 percent in kharif output compared to earlier poor rainfall years is the highest ever fall since 1972-73. This is explained by the lowest ever rainfall received in July (19 percent fall), which is normally the rainiest month of the season and most crucial month for kharif crops.

Deficient rainfall years	Monsoon rainfall (% departure from normal)	Rainfall in July (% departure from normal)	Kharif foodgrain production (percentage fall)
1972-73	-24	-31	-6.9
1974-75	-12	-4	-12.9
1979-80	-19	-16	-19.0
1982-83	-14	-23	-11.9
1986-87	-13	-14	-5.9
1987-88	-19	-29	-7.0
2002-03	-19	-49	-19.1

Economic Survey 2002-03, Page 157

Price risk

Information on price variability for agriculture commodities is provided in a study by ICRIER.⁵ This study compares the variability of prices in the domestic and international market and concludes that while inter-year variability is generally lower in the domestic markets than the international markets, intra-year variability is as high in domestic markets as in the international markets, if not higher (**Appendix 5**).

Price risks are important when farmers are producing for the market. For small farmers this would be especially relevant with specialization.

Prices are influenced by demand and supply factors. Food crops and vegetables are generally subject to gradual and predictable changes in demand. On the other hand, industrial crops are subject to business cycles and technological developments. While international trade will increase the range of demand side influences, it may also increase the possibility of diversification across a larger set of factors. The impact of supply fluctuations on prices will depend upon demand elasticity.

Government intervention plays a significant role in agricultural markets through minimum support price operations, public distribution system releases and changes in import/export policies.

⁵ Volatility of Agricultural Prices — An Analysis Of Major International And Domestic Markets, C S C Sekhar, June 2003, Working Paper No. 103, Indian Council For Research On International Economic Relations, New Delhi, India.

The actual prices received by farmers are likely to be determined by local infrastructure facilities and the integration of markets. According to the Committee on Long Term Grain Policy⁶ although markets are now much better integrated than in the past, and long-run integration is quite good, short-run integration is still fairly poor and prices often move very differently in different locations. Market integration is better across urban terminal markets than between urban and rural markets and is least integrated across rural markets.

The Committee specifically points out that producer prices in many parts of Bihar, Orissa, Uttar Pradesh and West Bengal are currently below full costs of production. The high Minimum Support Prices (MSP) declared are not being defended effectively, and private trade is paying prices which discount from the low prices at which public stocks are being offloaded. In complete contrast to the above, farmers obtain assured price support in operations organised by the FCI in Punjab and Haryana where market infrastructure is better and there is co-operation from state agencies which do bulk of the physical purchase.

According to the Committee, the main structural features within India's rural sector which have historically impeded the development of an integrated national market and realization of fair market prices by farmers are:

- Poor rural connectivity as a result of inadequate infrastructure, which increases transport and transactions costs, limits flows of information, and acts as a barrier to potential entrants in agricultural trade and processing. The pace of rural infrastructure development has slowed in recent years because of deterioration in State government finances, particularly in states with poor infrastructure.
- Limited holding power of farmers because of their low incomes, which causes large arrivals at harvest time and/or leads to dependence on credit from traders/moneylenders who can thus manipulate the prices received. Co-operative credit and marketing institutions, which were already weak, except in some regions and for some crops, are increasingly unable to withstand competition because many of these became too dependent on government financial support which is shrinking.
- Facilities provided by regulated markets have not increased in proportion to the trade carried out or market charges collected; there is apprehension that regulatory powers and exclusive rights granted to these markets for fostering more open trading are now being used to defend privileged access and are proving to be a barrier to further market development.

According to the Committee "the above mean that agricultural producers often face prices which are imperfectly correlated with national trends, are subject to greater variability, and are often depressed due to the operation of local monopolies". Moreover, "not only do

⁶ Committee on Long Term Grain Policy, Ministry of Consumer Affairs, Food & Public Distribution, July 22, 2002

farmers receive prices which are lower and more uncertain than in urban markets, they sometimes have to pay more for food items which they themselves do not produce, thus blunting the power of the price mechanism to signal comparative advantages and also depressing overall rural incomes”.

The Committee provides the example of cereal production in Eastern India to illustrate the role of market structure. The primary agricultural marketing network is extremely under-developed in Eastern India, including eastern parts of Uttar Pradesh and Madhya Pradesh. The operation of public agencies is limited to some levy procurement of rice, and provides almost no direct price support to farmers. Nonetheless, because of its intrinsic potential, this region had recorded high growth rates of cereals yields per hectare during the 1980s - about 4 per cent per annum, higher than national yield growth and much higher than the region's population growth. However, this promising development could not be sustained in the 1990s, and the rate of yield growth has since fallen below the national average and below population growth. Although reduced public investment and setbacks in technology extension are causes, the behaviour of producer prices is also important. These were higher in this region than in Punjab-Haryana in the early 1980s but fell below from the early 1990s as surpluses appeared, and now show larger fluctuations. Price differentials with other locations can be high because of poor infrastructure and high transport and transaction costs, and there is no effective floor during local gluts. Unless this is addressed, there will be insufficient incentive for the sustained yield increase which is required in this region for continued cereals self-sufficiency at the national level.

Role of futures markets

The newly developed futures markets in India are often presented as a means for farmers to hedge their price risk. However, farmers are likely to face several problems in hedging price risk using futures markets.

Futures position requires daily mark to market cash flows equal to the daily changes in futures price. This can create a liquidity problem for the farmer since the cash flows from the sale of the crop, whose price is being hedged, is only expected after the crop has been harvested.

The farmer is uncertain about the quantity to hedge since he faces both yield risk and price risk. For example, hedging the expected yield can leave him exposed if the actual yield deviates from the expected value. The hedging problem is complicated further by the correlation between the yield risk and price risk. The farmer is also likely to face basis risk because of fragmented markets for agriculture produce.

The extent of these problems can be mitigated if, for example, farmers organize themselves in a co-operative, but they cannot be completely eliminated.

2. Background to crop insurance in India

Discussions about the introduction of crop insurance had started at the time of independence. However, the first concrete steps were taken in October 1965 when the Government of India (GoI) decided to draw up a Crop Insurance Bill and a model scheme of crop insurance in order to enable the States to introduce crop insurance. After receiving comments from the State Governments, in March 1970 the draft bill and Model Scheme was referred to an expert committee with Dr. Dharam Narain as the Chairman. In its report, submitted in August 1971, the Committee concluded that it would not be advisable to introduce crop insurance in the near future, even on a pilot basis. Prof V.M. Dandekar examined in detail the arguments of the Expert Committee and strongly advocated the introduction of crop insurance (Dandekar 1976)⁷. The following were the major issues in the discussion on crop insurance.

Independent risks and time diversification

According to the expert committee, “Crop losses, when they occur, are often so widespread as to affect most farmers, in the region... Thus the principle that while many pay the premium only a few claim indemnities does not strictly apply in the case of crop insurance”. According to this argument, agriculture risk has a significant systematic component and cannot be diversified by pooling — a necessary condition for insurability. Dandekar argued that while this may be true for a single region, diversification would be possible over a wider area, e.g., the entire country. However, Dandekar also states that the “principal actuarial aspect of a crop insurance scheme is the year to year variation in crop yields”. Thus, “in many years the amount of premia received will nearly balance the amount of indemnities paid, though in some years the premia received will exceed the indemnities paid out and vice-versa”.

This is a reference to diversification over time as opposed to the diversification across space or individuals at a point in time, referred to by the Expert Committee. However, diversification over time cannot be a substitute for diversification over space or individuals. Unlike diversification across individuals, which reduces or eliminates variability over time, diversification across time cannot eliminate variability over time. Diversification across time only ensures that over a sufficiently long period of time of several years the insurer breaks even, but still has to withstand year to year fluctuations in profits.

Moral hazard problem and Individual and area based approach

Both Dandekar and the Expert Committee preferred the “area” approach to the “individual” approach. The individual approach requires individual ex ante assessment of risk and ex post assessment of loss for determining individual premium and claim payments.

⁷ “Crop Insurance in India”, V.M. Dandekar, Economic and Political Weekly, June 26, 1976

The area approach treats all farmers in a defined area as identical in terms of risk and loss and, therefore, paying identical premium and receiving identical claim amount. These are based on the average risk and average loss characteristics for the entire area. It was recognized that the area approach would give rise to a basis risk. "It is impossible, of course, to expect that the crop-outputs of all farmers in an area would be below their own normals whenever the average crop-output of the area is below its normal and vice versa. But if the area is small enough and is agro climatically homogeneous, the crop output of a majority of the farmers therein would be highly correlated". Therefore, even though the individual approach is the first best from the perspective of reducing the basis risk, the area approach is the preferred alternative in terms of the administrative costs of risk assessment and loss estimation, as well as being less susceptible to the moral hazard problem.

However, according to the Expert Committee the administrative cost of even the area approach would be quite significant since most of the data required for verifying the homogeneity of an area were not available from sources like the village revenue records.

Adverse selection problem and compulsory insurance

The area based approach, by assuming sufficient homogeneity in each area, reduces the adverse selection problem and hence the need for compulsory participation. According to Dandekar, "There is no such danger (of adverse selection) in a scheme based on the Area approach. In such schemes all participants are exposed to the same risk, which is determined by an independent chance system and in which the individual experience does not count".

However, it was felt that participation would be limited and premium collection difficult if the insurance were not made compulsory. "It is feared, with considerable justification, that collection of premium will prove a formidable if not an impossible task. The reasons are two fold. Firstly, there is the general difficulty of collecting any cash payments from the farmers on a regular basis because, for a large majority of the farmers, the cash position is usually nil if not minus. Secondly, in relation to the somewhat better-off farmers, as the Expert Committee says 'even if, in the initial stages, the farmers are attracted towards the Crop Insurance Scheme in the hope that they would get, in bad years, indemnities in excess of the premium payments, it would be difficult to sustain their interest in the Scheme once they realise that would, by large be getting back what they pay over a period.' Collection of premium from the farmers is undoubtedly a difficult task and may prove impossible if this to be done on a voluntary basis".

On this basis Dandekar recommended that the "crop insurance scheme should be linked, on a compulsory basis, with the crop loan system.... The entire amount of the crop loans should be insured. Premium should be deducted while advancing the loan. Indemnities when they become payable should be adjusted against the recovery of the loan". The main advantage of this approach is that, "Not only the scheme can immediately get off the ground but there will be hardly any administrative costs involved". This was also expected to solve

the problem of loan recovery since, “the entire agricultural credit structure is in urgent need of protection from the hazards of agriculture and this can be done only by means of an appropriate crop insurance scheme suitably linked to the agricultural credit structure”. A non-borrower farmer could also take the insurance on a voluntary basis.

Multi-crop insurance

The Expert Committee pointed out the advantages of a multi-crop yield insurance as opposed to a single crop insurance. A multi-crop insurance would require a lower premium given the lower variability of multi-crop yield, to the extent single-crop yields are not perfectly positively correlated. This is also more relevant for the farmer since it captures the total income rather than the income from a single crop. Dandekar agreed with this and recommended a multi-crop insurance based on an index of crop yield for each area. The index would be based on individual crop yields weighted by the acreage under each crop in the area.

Subsidies

While Dandekar proceeded largely on the basis of a self-supporting scheme he did not rule out “legitimate grounds for a certain amount of subsidy”. Dandekar suggested that less risky areas should be charged “slightly higher, but only slightly, higher premium *than warranted*” to subsidize more risky areas. This implies that while more risky areas would be charged higher premium than less risky areas, the difference would be less than the actuarial amount. Dandekar also provided for direct subsidy of high risk areas and of small and marginal farmers.

3. Operation of crop Insurance schemes

The **GIC** accepted most of the recommendations and initiated pilot schemes with two modifications: (**Dandekar** 1985)⁸. The proposal for a single scheme for all crops taken together, based on a composite index of agricultural production was not accepted. Instead it was decided to have separate schemes for different crops. It was argued that “a composite scheme for all crops together may not be intelligible to the farmers”. While the insurance was linked to agriculture credit as recommended it was not made compulsory “probably because it would not be politically acceptable or because of the fear that it would involve the GIC into very large liability”.

The pilot schemes lead to the introduction of the comprehensive Crop Insurance Scheme (CCIS) during the financial year 1985-86. This was replaced by the National Agricultural Insurance Scheme (NAIS) from the Rabi season of 1999-2000. Currently, a pilot project on Farm Income Insurance Scheme (FITS) is being implemented, with the potential to replace the NAIS.

⁸ “Crop Insurance in India: A Review, 1976-77 to 1984-85”, V. M. Dandekar, Economic and Political Weekly, June 22-29, 1985

Administration of Insurance Schemes

The newly formed Agriculture Insurance Company of India Limited has taken over the role of the Implementing Agency from the General Insurance Corporation. AIC is supposed to have the “overriding authority and overall responsibility in the operation of the scheme”. The state government gives consent for implementation of schemes; notifies the crops and areas; and generates actual yield data through crop cutting experiments at harvest time. The loan granting banks are responsible for issuing coverage; collecting premium and disbursing claims. Each bank identifies a Nodal Branch and the AIC works through the Nodal branch.

Area approach

All programmes are based on the area approach. The areas, and crops in each area, are to be notified by the State Governments opting for the scheme. The two major pre-requisites for an area and crop to be notified are:

- availability of past yield data for ‘adequate’ number of years.
- Requisite number of crop cutting experiments can be conducted for estimating the yield for each area. These are specified as 24 at the district level, 16 at the Taluka level, 10 at the Mandal level and at the Gram Panchayat level.

The NAIS requires the States to reach the level of Gram Panchayat as the unit of area within three years. The current unit of insurance in each state is given in **Appendix 6**.

Participation

In contrast to the voluntary nature of the pilot schemes, the CCIS covered farmers taking crop loans from Financial Institutions for growing food crops and oilseeds on a compulsory basis. The coverage was restricted to 100% of crop loan subject to a maximum of Rs.10,000 per farmer. Under the NAIS, the insurance continued to be compulsory for loanee farmers, but was also made available to all other farmers, growing the notified crops, on a voluntary basis. In the case of loanee farmers the sum insured would be at least equal to the crop loan advanced. All farmers can insure to the value of the threshold yield of the insured crop. They can also insure beyond the value of the threshold yield of notified area on payment of premium at commercial rates.

Thus the schemes are a mix of voluntary and compulsory participation. The schemes are voluntary at the state level in terms of specific areas and crops. The state governments decide their participation in terms of specific areas and crops in those areas. **Appendix 7** provides information on the crops notified by the various participating states. Once the specific area-crop combinations have been notified participation is compulsory for farmers in those areas cultivating the specific crops and taking agriculture loans. Thus Punjab, Haryana and Rajasthan have not participated in the insurance schemes. For example, the Haryana

Government found the premium rates too high “for a state like Haryana where a fair degree of drought proofing had been done and chances of damage to paddy and wheat were minimum”.⁹

Indemnity amount

The threshold or guaranteed yield for a crop in an area is the moving average based on the past three years in the case of Rice and Wheat and past five years in the case of other crops. This is compared with the actual yield, based on crop cutting experiments and the shortfall calculated as a percentage of the threshold. The amount of indemnity is the shortfall percentage times the sum insured.

There are three levels of indemnity — 90%/80%/70%, corresponding to low/medium/high risk areas for all crops, based on coefficient of variation in yield of past 10 years of data.

Premium rates and subsidy

In the case of CCIS the premium rates were 2% for cereals and millets and 1% for pulses and oils. The NAIS specified maximum rates of 3.5% for kharif bajara and oilseeds and 2.5% for other kharif crops such as cereals and pulses. For Rabi crops the premium was 1.5% for wheat and 2% for other crops. Farmers were to be charged the actuarial rates in case these were below the maximum. Actuarial rates were also to be charged for kharif and rabi annual commercial and horticultural crops. Transition to the actuarial regime in case of cereals, millets, pulses and oilseeds would be made in a period of five years. The actuarial rates would be applied at the District/Region/State level at the option of the State/UT.

The following table gives the rates being charged and the actuarial rates for Gujarat for Rabi 2003-04.

Crops	Indemnity Level	Premium rate for sum insured upto value of threshold yield (Normal rate fixed by Government of India)	Premium rate for sum insured beyond the value of threshold yield fixed by GIC (Actuarial rate)
Wheat (Irrigated)	90%	1.50%	3.45%
Wheat (Unirrigated)	60%	1.50%	2.75%
Rapeseed & mustard	80%	2.00%	3.20%
Gram	80%	2.00%	6.95%
Potato	80%	2.85%	2.85%
Summer Groundnut	80%	2.00%	4.00%
Summer Bajra	80%	1.95%	1.95%

Source: Government of Gujarat Notification

⁹ Other reasons for non-participation were (i) Productivity of the main crops in the state are gradually rising so that there is very little chance of farmers getting any indemnity under the formula of threshold yield and (ii) a financial liability of Rs. 17.25 crores consisting of a one time liability of Rs. 5 crores; annual liability of Rs.3.25 crores for administrative expenditure; Rs. 1 crore for conducting crop cutting experiments; and Rs.8 crore as state share to provide 50% subsidy of the premium.

The CCIS and the NAIS provide for a 50% premium subsidy for small (1ha) and marginal (1 - 2ha) farms. The subsidy burden is to be shared equally by the State and Central Government.

The premium subsidy is to be phased out on a sunset basis in a period of 3-5 years.

Sharing of risk

Under the CCIS all premiums and claims were to be shared by the Central and State governments in the ratio of 2:1.

The NAIS envisages a transition to actuarial rates in the case of food crops & oilseeds over a five year period. During this period claims beyond 100% of premium will be borne by the governments. Following the transition to actuarial rates, for the first three years claims beyond 150% shall be paid out of a Corpus Fund. After the three year period claims beyond 200% will be met out of the Corpus Fund.

In the case of annual commercial crops and annual horticultural crops which are subject to actuarial rates claims beyond 150% of premium in the first three years and 200% of premium thereafter shall be paid out of Corpus Fund. 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.

The Corpus Fund will be created with contributions from the Government of India and State Govt/UT in 50:50 basis. A portion of Calamity Relief Fund (CRF) will be used for contribution to the Corpus Fund.

4. Performance of crop insurance schemes

Information on the overall performance of the CCIS is provided in **Appendix 8** and on the NAIS in **Appendix 9**. In the case of the CCIS the overall claims to premium ratio is 5.7, with significant variations across crops and states. The most significant result is the claim ratio of 20 for Gujarat and a similar ratio for groundnut. In fact Gujarat accounts for almost 60% of the total claims and groundnut accounts for 53% of total claims.

There are two outstanding features of the NAIS performance. As shown in **Appendix 9.1**, The cumulative totals for the seven seasons, Rabi 1999-2000 to Rabi 2002-03, show a claim to premium ratio of 4.27 and Gujarat alone accounts for almost 43% of total claims. Among crops, as shown in **Appendix 9.2**, groundnut accounts for 36% of claims and paddy for another 27%. Even in the case of annual commercial and horticultural crops, which are supposed to be charged on an actuarial basis, the claims to premium ratio is 2.29. These crops account for 18% of total claims and 34% of total premium. Food crops and oilseeds have a claim to premium ratio of 5.31. Season-wise details for Gujarat are provided in **Appendix 9.3**.

There are two factors that can help explain the performance of crop yield insurance - geographically uniform premiums set below actuarial levels, and no risk sharing by the implementing agency.

Uniform premium below actuarial level

There were two rates under the CCIS and four rates under the NAIS, based on crop categories, but making no distinction for geographical areas. The schemes do make a distinction in the level of indemnity. There are three levels of indemnity — 90%/80%/70%, corresponding to low/medium/high risk areas for all crops, based on coefficient of variation in yield of past 10 years of data. These relatively uniform premium rates in the presence of significant differences in yield volatility across different regions and crops can be expected to give rise to the problem of adverse selection.

For example, as shown in **Appendix 10**, in the case of rice the coefficient of variation of yield per hectare, based on the last 20 years of data, ranges from 6% for Punjab to 21% for Bihar, with an all India average of 13%. The difference is more pronounced in the case of groundnut. As shown in **Appendix 10** the coefficient of variation of yield, calculated using the last 20 years of data varies from 54% for Gujarat to 17% for Maharashtra and Karnataka. The high coefficient of variation for Gujarat may explain the large share of Gujarat in the total claims payment. The all India coefficient of variation for groundnut is 14%.

Appendix 11 provides information on yield variability on an all India basis. The large coefficient of variation on all India basis for individual crops implies that even after geographical diversification significant variability remains at the all India level for individual crops. Moreover, the coefficient of correlation across crop yields is high, indicating limited diversification across crops. This implies the presence of significant systemic risk in yield variability and the need for reserves or reinsurance for an actuarially based system. An additional advantage of actuarial rates is that it will facilitate timely payments of claims. Currently, the payments are delayed because of delays in payments by the State governments following claims. With actuarial rates the implementing agency will receive premium and subsidies up-front. Of course, the implementing agency will now have to maintain reserves and factor in the costs of managing such reserves.

No Risk sharing by the Implementing Agency

The second major problem with the current crop insurance system is that the Implementing Agency (IA) — the GIC till 2002-03 and the Agricultural Insurance Company since April 2003 — has no financial stake in the schemes. They are reimbursed for their administrative expenses and neither bear any of the risks nor earn any returns from the schemes. The major task of the implementing agency is the management of financial flows between the governments and the financial institutions dealing with farmers.

The IA also has little incentive and no means to expand crop insurance coverage. It is completely dependent on rural financial institutions - co-operative credit societies, regional rural banks and the rural branches of commercial banks. Co-operative credit societies have been playing the leading role in the disbursement of production credit to agriculture accounting for about 53% of total short-term credit to agriculture in 2001-02. However, the co-operative credit system is suffering from serious problems as pointed out by the Working Group on Agriculture Credit, Cooperation and Crop Insurance for formulation of the tenth five years Plan:

While some of the cooperative banks are functioning well, the cooperative credit structure in general faces wide ranging problems like resource crunch, mismanagement, poor governance, low level of member participation, lack of credit discipline, high level of erosion of net worth and lack of professionalism in the banks.

Moreover, some of the disparities in crop insurance coverage across states may be partly due to the disparities in the functioning of the credit system. As pointed out by the Working Group.

The growth of the cooperatives across the country has witnessed regional, sectoral and sectional skewnesses. There are wide disparities in the performance of credit institutions both in regard to deposit mobilisation and deployment of credit. In the North Eastern region, the deposit mobilisation and credit disbursed was 3.66% and 1.75% of the total credit disbursement respectively as on 31.3.2000, whereas it was 37.93% and 32.54% in the Western region. Likewise certain sectors like rainfed farming, horticulture, storage, processing etc. have been starved of credit as compared to farm mechanisation, minor irrigation and Animal Husbandry. The small and marginal farmers who constitute about 78%, get only about 31% share in the total bank credit.

Livestock Insurance

Apart from crop insurance livestock insurance, consisting mainly of cattle insurance, is being implemented by the four public sector general insurance companies. Under the various Livestock Insurance Policies, cover is provided for the sum insured or the market value of the animal at the time of death, whichever is less. Animals are insured up to 100 per cent of their market value normally. The table below provides information on these policies. The fall in number of animals insured in the past few years is attributed to a reduction in the number of low value animals, such as, sheep, calves and goats which at present constitute about 25 per cent of animals covered.

Year	No.of animals Insured (million)	Premium collected (Rs crore)	Claims (Rs crore)	Claims to premium ratio
1977-98	22.83	137.06	102.75	74.97
1998-99	23.50	145.47	105.69	72.65
1999-2000	17.10	131.19	125.26	95.48
2000-01	15.35	144.70	131.71	91.02
2001-02	16.49	135.38	107.70	79.55

Source : Ministry of Agriculture, Economic Survey 2002-03 page 168

5. Pilot Project on Farm Income Insurance Scheme

The AIC is carrying out pilot exercises of a new Farm Income Insurance Scheme (FITS) in 20 districts during the 2003-04 Rabi season for rice and wheat. The scheme is strictly 'crop' income insurance and not 'farm' income insurance as it is designed to protect the income from a particular crop. Under the FITS the indemnity calculation is modified to account for income shortfall, not just yield shortfall. In this case the farmer will be paid the difference between the guaranteed income and the actual income per hectare. The guaranteed income is obtained by multiplying the threshold yield by the minimum support price. The actual income is the actual yield multiplied by the current market price. The market price used for calculation of actual income is subject to a maximum of 120% and a minimum of 80% of the MSP.

The scheme also incorporates the following changes:

- a) The pre-requisites with respect to availability of past yield data for an area and crop to be notified has been changed from 'adequate number of years' in the NAIS to 'at least 10 years' in the FITS.
- b) The NAIS requires the States to reach the level of Gram Panchayat as the unit of area in a maximum period of three years. This requirement is modified to a recommendation 'to notify as small a unit area as possible, so that they are more likely to be homogeneous'.
- c) The FITS proposes to charge actuarial rates at the State/District level. These rates would be calculated and revised by the AIC every year.
- d) With the switch to actuarial rates the subsidy would be higher. Small and marginal farmers will receive a subsidy of 75% and other farmers a subsidy of 50%.
- e) Under the FITS all claims, exceeding 100% of premium collected less the loading towards administrative and marketing administrative and marketing expenses, would be borne by the Central Government. This is because "The product is new with unforeseen financial liabilities, as the Actual Income is based on market price, while guaranteed income is based on MSP (a national price without link to market price). Moreover, appropriate rating methodology is also not available at this stage".

- f) The state government will ensure submission of market price data through its AMB/ Mandi Board/Directorate of Marketing and the APMCs.

Minimum Support Price and procurement

The origins of the Farm Income Insurance Scheme are in the attempts to reform the Minimum Support Price (MSP) based procurement of foodgrains.

The government has been announcing Minimum Support Prices (MSP) for 24 major crops based on the recommendations of the Committee on Agricultural Costs and Prices (CACP). Farmers are free to sell their output in the open market or to the Government at the MSP. Till the mid 1970s, the government announced two types of administered prices:¹⁰

- (i) The Minimum Support Prices (MSP) which serves as the floor prices. It provides a long- term guarantee for investment decisions by farmers.
- (ii) The Procurement Prices is the price at which grain was to be domestically procured for buffer stocks and released through the public distribution system (PDS). It was announced soon after the harvest began. Normally the procurement price was lower than the open market price and higher than the MSP.

This policy of two official prices being announced continued with some variation till 1973-74, in the case of paddy. In the case of wheat it was discontinued in 1969 and then revived in 1974—75 for one year only. Since there were too many demands for stepping up the MSP, in 1975-76, the present system was evolved in which only one set of prices was announced for paddy and wheat.

Effectively, the government follows an open ended procurement policy and there is no procurement target. It buys whatever is offered for sale at MSP. Rice and wheat are the two principal commodities where the government's role is most pronounced. Procurement operations for other crops are carried out only when market prices fall below MSP. As shown in the Table below Andhra Pradesh, Punjab and Haryana are the major rice procuring states. Punjab, Haryana and Uttar Pradesh account for the bulk of wheat procurement. Despite recent deceleration in foodgrains output growth, procurement by the FCI has increased significantly over the years.

Procurement of wheat and rice by major states 2001-02

(lakh tonnes)	RICE		WHEAT	
	Production	Procurement	Production	Prcurement
AndhraPradesh	113.9	64.25		
Haryana	27.2	14.84	94.4	64.07
Punjab	88.2	72.82	155.0	105.6
Uttar Pradesh	124.6	19.36	250.2	24.46
All India	930.8	221.29	718.1	206.3

Source: Agricultural Statistics at a glance , 2003, **DAC**, MOA

¹⁰ This section is based on material from Economic Survey, GoI, 2002-03, Chapter 5

The MSP is finalized based on recommendations of the CACP. The price recommended by the CACP for a particular commodity covers 'C2 cost', which is the comprehensive cost of production and takes into account all the cost components other than management cost. After the recommendations of the CACP are received there is a tendency on the part of the Government to enhance the recommended price of certain commodities. Consequently, the MSPs, particularly of certain crops like rice and wheat, have increased substantially over a period of time. In the case of certain other commodities, particularly pulses and coarse cereals, the MSPs have tended to remain low. Thus over a period of time, the MSPs have grown favourably in respect of certain crops and gone against certain other crops. Such price increases have led to reduced crop diversification, distorted domestic market prices and eroded export competitiveness.

Increased procurement has also resulted in the FCI being saddled with large stocks of foodgrains, much above the stipulated buffer stock norms. FCI has become the sole buyer, stockist and seller of foodgrains as the high MSP has eliminated private trade. Shortage of storage space has in turn pushed up costs through wastage and deterioration of stocks. As pointed out by the Committee on Long Term Grain Policy, "These stocks are deteriorating because of shortage of storage space, but to hold these the Centre is spending more than what it expends on Agriculture, Rural development and on Irrigation and Flood control taken together".

Replacing MSP based open market operations with income insurance

According to a proposal submitted by the Department of Agriculture and Co-operation (DAC) to the Committee on Long Term Grain Policy, the main cause of the existing problems was the linking of support prices and procurement at those support prices. The proposal sought to delink MSP and procurement and provide income protection, instead of mere price support, through an insurance scheme. The DAC proposal envisaged that MSPs will continue to be declared but there would be no physical procurement at MSP. Instead the MSP would be the basis for calculations of the indemnity on insurance, with farmers receiving compensation through insurance whenever actual market prices fell below MSP.

However, the committee argued that procurement operations are needed to ensure actual price stabilisation and not just income protection. Moreover, if indemnity is based on MSP, "this will make insurance subject directly to government decisions, reducing the chances of this being a purely commercial operation or of it being accepted as a WTO "Green Box" measure. It is preferable on both these grounds to make actual average past prices the basis of indemnity calculations". According to the committee, this scheme could be a viable method of compensation in the transition to a lower MSP. The Committee also argued that by limiting the scheme to rice and wheat it would provide preferential treatment for these crops and may affect crop diversification adversely. "Any insurance scheme should aim at simultaneously providing insurance both for cereals and major competing crops in the region".

The Pilot Farm Income Insurance Scheme reflects the original proposal of income insurance without discontinuing procurement at MSP.

6. Calamity Funds

The Calamity Relief Fund (**CRF**) was established, separately for each state, on the basis of recommendations of the Ninth Finance Commission. The CRF is to be used for meeting the expenditure for providing immediate relief to the victims of cyclone, drought, earthquake, fire, flood and hailstorm. The centre and the state contribute to this fund in the ratio of 75:25. The total amount of the fund for all states was worked out at Rs.804 crore per year. The Tenth Finance Commission determined the size of the fund at Rs.6,304 crores for the period 1995-2000.

The Eleventh Finance Commission raised this amount to Rs. 11,007 crores for the period 2000-05. **Appendix 12** provides the distribution of this amount over this period across the states.

Provisions in the Calamity Relief Fund are based on past expenditures. However, some states have argued that “considerations such as average actual expenditure on relief measures in the past should be dispensed with, as very often resource constraints prevent a backward state from meeting the full requirements of administering relief. The commission rejected this on the ground that any other basis such as ‘proneness to calamities’ would be difficult to assess on a uniform basis across states.

The Tenth Finance Commission had recommended the setting up of a separate central fund — the National Fund for Calamity Relief (NFCR) — to provide assistance to the states affected by ‘natural calamity of rare severity’. The Commission, however, did not provide a definition, of ‘calamity of rare severity’. It fixed the size of the NFCR at Rs.700 crore, to be built up over the period 1995-00, with the centre and the states contributing in the ratio of 75:25. In the absence of a clear definition of ‘calamity of rare severity’ in the first three years of the scheme the centre received requests seeking a total assistance of Rs.24,000 crores. As shown in **Appendix 13** releases from the NFCR during 1995-2000 amounted to Rs. 2,555 crores.

Given the problems in defining ‘natural calamity of rare severity’ the Eleventh Finance Commission recommended that the NFCR scheme should be discontinued and replaced with a National Calamity Contingency Fund (NCCF) scheme. This fund would be constituted by the central government for dealing with calamities of a ‘severe nature’. Such calamities would include, cyclone, drought, earthquake, fire, flood and hailstorm, considered to be of severe nature requiring expenditure by the state government in excess of the balance available in its own Calamity Relief Fund. The National Centre for Calamity Management (NCCM) will monitor the occurrence of natural calamities on a regular basis and make recommendations for relief out of the NCCF. The central government will provide the initial corpus of Rs.500

crores. Any assistance provided by the centre to the states is to be financed by levy of a special surcharge on central taxes for a limited period.

Specific provisions for relief to farmers from the funds are provided in **Appendix 14**.

During the deliberations of the Eleventh Finance Commission the Ministry of Agriculture recommended that the National Agriculture Insurance Scheme should be implemented by all the States, failing which no assistance should be given to the agricultural sector in the State at the time of natural calamities. The Ministry of Finance suggested adoption of an insurance fund approach to the entire scheme of calamity relief to a State, with a limit on the amount, which could be drawn by the State as entitlement and should be related to the State's contribution. Any assistance beyond the agreed limits on entitlement should be only in the form of ways and means assistance.

The Ninth Finance Commission had earlier examined the feasibility of establishing a national insurance fund to which the States may contribute a percentage of their revenue receipts. The Commission had noted that a natural calamity, by its very nature and magnitude, posed problems, which no agency outside the government could tackle exclusively and adequately. "The process of getting the loss assessed by an external agency was bound to be complicated and time consuming which would defeat the very purpose of providing timely succour to the affected people. Besides, the largest group of sufferers in a natural calamity are the poor and the weak that have hardly any assets to insure". The Ninth Finance Commission, therefore, found that the concept of an insurance fund for disaster relief was neither viable nor practical.

The Eleventh Finance Commission was also of the view that any insurance cover in which the premium is paid fully by the Centre and States may not reduce the financial burden of the Centre and States, as compared to a fund created at the Government level and used for meeting expenditure on calamity relief. The Commission noted the need to strengthen the crop insurance scheme as a supplementary measure to what is done by the Government for providing relief at the time of natural calamity.

The Calamity Relief Funds were utilized during the drought of Kharif 2002, along with other measures. The steps taken included:

1. Release of Rs.1,227 crore of Central share of Calamity Relief Fund (CRF) and Rs. 1,018 crore released from NCCF for drought relief.
2. The principal amount of crop loans for Kharif 2002 season were converted into term loans to be recovered over a period of five years in the case of small/marginal farmers and four years in case of other farmers. The interest due in the current financial year on Kharif crop loans were deferred in such a way that the first installment of interest repayment would be 20 % of the deferred interest. This installment of deferred interest was waived by the banks, who would be reimbursed by the Government of India.

3. One Time Drought Relief Price ranging from Rs.20/- per quintal per paddy, Rs.15/- per quintal for bajra and sunflower, Rs.10/- per quintal for soyabean and pulses etc.
4. Extension of Agriculture Input Subsidy to farmers (other than small and marginal farmers), with land holding upto 2 hectares.

7. Rainfall Insurance

Private insurers, and more recently the government insurance company AIC, have implemented pilot projects in rainfall insurance. Two pilot projects implemented by ICICI Lombard are described below.

Rainfall Insurance in Mehboobnagar district (Andhra Pradesh)

ICICI Lombard has designed rainfall insurance policies with support from the World Bank. A pilot project was carried out in the Mahububnagar district of Andhra Pradesh through the Krishna Bhima Samruddhi (KBS) Local Area Bank. KBS has been promoted by BASIX and operates in the district of Mahububnagar in Andhra Pradesh and Raichur and Gulbarga in Karnataka. BASIX is a rural livelihood promotion institution working through an NBFC Bhartiya Samruddhi Finance Limited and an NGO, Indian Grameen Services. The pilot scheme was launched in June 2003 for the kharif season 2003-2004 in Mahububnagar district. KBS sold policies to 154 groundnut farmers and 76 castor farmers. The policy is limited to crop loans given by KBS to these farmers. All the farmers are members of the Borewell Users Association (BUA). The BUA had been established as a part of an AP Government project, which provides for 85% of the cost of community bore-wells for irrigation of lands belonging to multiple households from the village. The BUA has been taking loans from KBS on behalf of its members. It had obtained a loan of Rs.4.5 lakhs in 1999 and has grown to borrow Rs.13 lakhs during 2003-2004. It has maintained a 100% repayment rate. Government crop insurance was not required since the loans had been made to the BUA and not to individual farmers.

The insurance policy makes payments if the cumulative rainfall during the season falls below the historical average. This is implemented through a rainfall index. As an initial step a technical feasibility study was carried out to establish correlation between rainfall and yield of specific crops in Andhra Pradesh. The daily rainfall data for the past 30 years was obtained from the IMD. In designing the rainfall insurance product the key task is to develop the appropriate index. The rainfall, insurance is then a put option on this index with a strike price and premium amount. Unlike a simple put option, the payoff pattern of rainfall insurance need not be linear in the value of the index.

The main steps in designing the insurance contract are:

1. Collection of rainfall and production data

2. Selecting the appropriate rainfall period. This is determined primarily by climate and plant physiology. One important consideration is that the last date for purchasing insurance should precede the commencement of the rainfall period by a sufficient number of days.
3. Constructing crop and region specific rainfall indexes by assigning weights to different rainfall periods in order to maximize the correlation between yields and rainfall. Agronomic information is used to determine the critical rainfall periods. Moreover, excess rainfall, may not contribute to yields, and during some periods, such as harvesting, even reduce yields.

The weights used for constructing the groundnut index are given in **Appendix 15**. The significant feature is the double weights assigned to the 10-29 June period, 0 weight to the 30 June-9 July period and 40% weight assigned to the 9 August - 7 September period. These are related to the relative importance of rainfall during the various periods.

Farmers receive a payment if the level of the index falls below the predetermined threshold (the strike price of the option). The payment schemes for groundnut is given in below.

Groundnut farmer packages, claim slabs and rate of compensations

	Payment per % point for incremental shortfall as a % of the Normal Rainfall Index (=635)				
	First 5%	Next 5%-25%	Next 25%-65%	Next 65%-100%	Max possible claim with 100% shortfall
Landholding > 5 Acres Premium Rs 900	0	Rs 30	Rs 175	Rs 650	Rs 30,000
Landholding 2.5 - 5 Acres Premium Rs 600	0	Rs 25	Rs 100	Rs 500	Rs 20,000
Landholding <2.5 Acres Premium Rs 450	0	Rs 20	Rs 75	Rs 310	Rs 14,000

Mehboobnagar district received the best rainfall in the past five years. However, the monsoon was delayed leading to delayed sowing and in turn affecting the yield of groundnut. Given the weights assigned to different time periods the delayed monsoon resulted in a decline in the index. The groundnut Actual Rainfall Index was 516 mm. This is a shortfall of 21 percentile from 653 mm of NRI resulting payments to the farmers.

Indemnity payments

Details of Landholding	No of farmers	Claim per farmer	Total claim	Premium per farmer	Break-even deficiency %	Total premium
below 2.5 Acres	140	16*20=320	44,800	450	26%	63000
above 2.5 and 5 Acres	13	16*30=480	6,240	600	25%	7800
above 5 Acres	1	16*30=480	480	900		900
Total			51,520			71,700

Farmer's feedback on the product¹¹

While the farmers were most impressed by the prompt payment by the insurance company they perceived a number of problems with the product

- Rainfall data is taken from Mahaboobnagar, which does not represent the rainfall of their village. According to them there is a difference of 20 mm rainfall between the village and mandal and about 200 mm between mandal and the district. They also suspected that the rainfall is not adequately recorded by the government machinery. As a part of the insurance pilot a rain gauge has been installed in the premise of the primary school of the villages. A member of the BUA executive body is responsible for measuring the rainfall at 7 AM every day.
- Lack of clarity on the claim calculation: Farmers are not clear about point (percentile of the normal rainfall index). They would prefer claim calculation based on absolute shortfall in millimeters rather than in percentiles.
- Farmers would prefer a simple linear relationship between the rainfall and the claim amount. They are unable to appreciate the trigger points and different slab rates.
- The insurance needs to provide for rainfall failure during the sowing season since this results in a loss of almost 50% of the crop value. Farmers would like to receive phase wise payouts subject to the maximum limits.
- Similarly, excess rainfall during harvesting time results in a loss of the total crop. The insurance contract should provide for this contingency as well.
- There is a need to have frequent interactions between the representative of the insurance company and farmers to clarify doubts and questions about the product.

Rainfall Insurance for Orange growers in Jhalawar (Rajasthan)

The Government of Rajasthan launched a scheme on June, 2004, in collaboration with ICICI Lombard, for Weather Insurance for oranges on a pilot basis in Jhalawar, Baran & Kota districts. This policy incorporates several changes based on the Mehboobnagar experience. It also relies on direct marketing rather than delivery through rural financial

¹¹ Based on a meeting with farmer customers of the rainfall insurance pilot in village Pamireddi Pally, Mandal: Atmakoor, District: Mehboobnagar on January 29, 2004 documented by D Sattaiah AMP, BASIX.

institutions. Finally, it involves public-private partnership with the government providing 50% subsidy to all small & marginal farmers. 782 farmers (7% of all the Orange cultivators in the district) were provided a cover for 613 acres for a sum insured of Rs. 18.3 million.

Orange cultivation is subject to two principal weather perils: availability of an Effective Shower for initiation of flowering (Peril I); and Dry spell during flowering (Peril II)

Peril I - Effective Shower for initiation of flowering

Orange trees require an 'effective shower' to initiate flowering. An effective shower is defined as at least 60 mm of rainfall on any 3 consecutive days during the flowering initiation period, Jun 15 to July 30. If there is no 'effective shower' sub optimal flowering leads to yield loss.

With this cover the farmer becomes eligible for benefits if there is no 'effective shower' during the flowering period, i.e., the maximum observed rainfall over any three consecutive days is less than 60 mm. The payout structure is based on the empirical evidence of yield loss in the past based on deficit in event rainfall levels. The compensation would be calculated as

$$(60 - \text{Maximum observed rainfall over any 3 consecutive days in mm}) \times \text{Rs. } 125$$

The maximum compensation of Rs.5,000 (Sum Insured) would be payable if the maximum observed rainfall over any three consecutive days is less than or equal to 1 mm. If a policy for this cover had been implemented in the past, payouts would have been made in the years 1968, 1972, 1983, 1984, 1985, 1987, 1989, 2002. For example in the years 1987 and 2002 the insured would have received Rupees 4,400 and 2,000 respectively.

Peril II — Dry spell during flowering

It is observed that a dry spell of 10 to 15 days during July to September can lead to flower drop and consequent yield loss. This period can be further broken down into sub periods and each of the sub period requires a certain minimum amount of rainfall. This has been fixed at 30 mm. Payout structure is based on the 'Water Deficiency — Yield Loss' function and empirical evidence of yield loss in the past. The cover provides payouts for each phase in relation to the importance of the phase in impacting the final yield.

Phase	1	2	3	4	5	6
Period	July 1-10	July 11-20	July 21-30	July 31- August 14	Aug 15-29	Aug30— Sep 28
LowerLimit(mm)	30	30	30	30	30	30
Payment per mm of deviation on Lower side (Rs)	15.15	15.15	15.15	15.15	15.15	15.15
Payment per mm of deviation on Lower side (Rs) if no (zero) rainfall is observed in previous period	15.15	30.30	15.15	15.15	45.46	45.46
Payment Limit(Rs)	455	909	455	455	1,364	1,364

If during any period observed rainfall is lower than 30 mm then the insured would become eligible for compensation calculated as

$(30 - \text{Observed rainfall during period in mm}) \times \text{Payment per mm of deviation on Lower side}$

In case of phases 2, 5 and 6 if rainfall received during the preceding phases (i.e phases 1,4 and 5 respectively) is zero then the rate for phase 2 would be double of 15.15 and for phases 5 and 6 it would be triple. The Sum Insured amount is Rs 5,000, which is the sum of the payment limits for all the phases.

If a policy for this cover was implemented in the past, payouts would have been made in the years 1960 – 61, 1963 – 68, 1972, 1974 – 77, 1979 – 85, 1987 – 89, 1991 – 92, 1995 – 2003. For example in the years 1979 and 2002 the insured would have received Rupees 1,818.

Maximum number of units and premium

A farmer with 1 acre of land can take upto 6 Units of either of the perils subject to maximum Sum Insured of Rs 30,000. A farmer with 1 Hectare of land accordingly may take insurance for upto 15 Units of either of the perils subject to a maximum Sum Insured of Rs 75,000.

Premium for Peril 1 & Peril 2 for units of Sum Insured of Rs 5000 is provided below.

Peril	Premium	Premium for Small & Marginal Farmers
Peril I - Effective Shower	830	415
Peril II — Dry spell during flowering	630	315

Farmers who are availing insurance without subsidy and opting for Peril 1 & Peril 2 in pairs would be eligible for a discount of Rs 60 on the total price.

The Policy was made available at the following locations:

- Branches of Land Development Bank
- Branches of Jhalawar Cooperative Bank
- Rural Branches of Commercial Banks in Jhalawar
- *Jan Mitra* kiosks
- Direct sales agents of ICICI Lombard

Claim Settlement

The reference weather station for procuring weather data during the policy period would be the IMD station at Jhalawar. The weather data would be regularly collected by the insurer during the policy period and submitted to a professional weather data-cleaning & enhancing agency for verification. Claims would be normally settled within 30 days after the cover period is over on the basis of cleaned & enhanced data.

Claim settlement mechanisms would vary according to the distribution channels. In case of Banks, ICICI Lombard would pass on the claim amounts to them who in turn can distribute to the farmers. In case of other channels ICICI Lombard will specify a date and a place where claim servicing can be done. On the said date ICICI Lombard representative will be present at the specified place and distribute the claim amount to the farmers who produce the acknowledgement slip of insurance. In addition farmer would also be asked to present a copy of his land records for verification.

Comparison of area based crop yield insurance and rainfall insurance

It is useful to compare area-based crop insurance with rainfall insurance on several important dimensions.

Systemic risk: Both rainfall and crop insurance are likely to be subject to similar systemic risk component. This will be especially true if the rainfall index is created separately for each crop- area using weights which maximize the correlation between the rainfall index and crop yield.

Moral hazard: Unlike individual crop yield insurance, area based crop yield insurance is subject to significantly reduced moral hazard problems. Of course, the moral hazard problem is completely eliminated in the case of rainfall insurance.

Basis risk: Area based crop yield insurance will be subject to basis risk for the farmers depending upon size and heterogeneity of the unit of area chosen. Rainfall insurance will also be subject to a similar kind of basis risk since the rainfall data can only be collected from a limited number of locations within a geographical area. An additional source of basis risk for rainfall insurance is the less than perfect correlation between rainfall and yields. This basis risk is reduced by choosing weights, which are appropriate for the crop and region in constructing the rainfall index.

In principle basis risk has three different components depending on the design of a particular contract.¹² The *temporal component* of the basis risk arises from the fact that the sensitivity of yield to rainfall varies over the stages of growth. During each stage, the amount of rainfall has different effect on the prospective yield and historical variations of rainfall are also different. The *spatial component* of the basis risk reflects the fact that rainfall differs across locations even within the same region. A contract based on measurements at one station may bear very little basis risk for some farmers, but perform very poorly for others. The *crop-specific component* of the basis risk refers to variation in planting times, duration of growing season, and sensitivity to rainfall across different crops. Moreover, even planting times for the same crop may vary from region to region depending on such factors as the climate and average temperatures.

¹² Innovations in Agriculture and Natural Disaster Insurance”, M. Miranda and Dmitry V. Vedenov, American Journal of Agricultural Economics, 83 (3), August 2001, 650-655

In terms of contract design there is a trade-off between simplicity of design, transparency, and low transaction costs on the one hand and the basis risk faced by the farmers on the other. As more and more of basis risk is sought to be reduced there will be an increase in the number and variety of contracts that will have to be offered. The contract design in the pilot projects appear to be aimed at minimizing the basis risk. This may not be a viable strategy as coverage increases.

Adverse selection: This is a result of asymmetric information — the farmer usually has better information about his risk than the insurance company when setting the premium rate. This problem is addressed through the underwriting process. This involves developing risk assessment instruments and using these instruments to assign a risk classification to potential policyholders. In both area based crop yield insurance and rainfall insurance the classification is done on the basis of geographical area. The larger the area the less likely is it to be homogeneous and the greater the potential for adverse selection.

In the case of crop yield insurance the size of the area is determined by the costs of the crop cutting experiments (CCE) necessary for establishing area yield. The NAIS specifies the minimum number of CCEs required for a given unit area. Under the existing system of General Crop Estimation Survey about 5 lakh CCE are undertaken for all crops. Crop wise distribution of the CCE is given in **Appendix 16**. In order to reduce the problems of adverse selection and basic risk the NAIS has set an objective of moving to the Gram Panchayat as the unit of insurance. This would require about 74 lakh CCEs, something beyond the manpower and financial resources of the states. Moreover, it would be difficult to ensure the accuracy of such a large number of CCEs. According to the pilot project on FIIS, “alternative methods of yield-rate assessments based on remote sensing data or econometric methods may also be explored in the future with the purpose of increasing accuracy levels of information”. Such alternatives may also reduce the time lag in obtaining yield information and increase the timeliness of payments to farmers.

In the case of rainfall insurance the area for classification purposes will depend upon the system of rainfall data collection. In India the Indian Meteorological Department maintains surface observatories, about one in each district. About two-third of the observatories are manned by staff of the State governments, schools etc., on payment of an allowance by the department. The department also provides instruments and stores. In addition there are about 8,600 non- departmental rain-gauge stations, though only about 3,500 are in reporting condition. Overall, the system appears to be in a poor state, especially in certain states, and would require significant upgradation and maintenance, to be useful for supporting a rainfall insurance scheme.

Rainfall insurance or derivative

One issue relevant from a legal and regulatory perspective is the similarity and differences between rainfall insurance and a rainfall derivative in the form of a put option.

In principle a rainfall insurance and a put option are identical in terms of their payoffs. However, insurance usually requires an “insurable interest” and a loss of pecuniary nature in relation to the insurable interest. The amount payable to the insured need not be based on the actual loss but could be predetermined. This is the case with “valued” policies. These requirements do not apply to weather derivative.

The groundnut rainfall contract for Mahbubnagar is clearly associated with an insurable loss. This has been achieved through the weights used in the construction of the rainfall index and the relationship between the payoffs and the level of the index. The weights have been chosen to maximize the correlation between the rainfall index and groundnut yield in the region. The payoff pattern is supposed to capture the increasing severity of losses with progressive rainfall deficiency. These features tend to increase the complexity of the product and more difficult for the farmers to understand. This problem has been addressed in the orange insurance by basing payments on actual rainfalls and not on an index. The payment pattern is non-linear in the rainfall level to capture the non-linearity in the relationship between rainfall and yield

8. Private participation in agriculture insurance

Models of private participation in agriculture insurance can be defined in terms of the extent of risk sharing by private insurers. At one extreme is the current implementing agency (IA) model in India where the IA bears no risk, earns no return and is merely reimbursed its administrative expenses. Such a model provides poor incentives for extending coverage and monitoring and controlling moral hazard and adverse selection. At the other extreme is a model where the private insurer bears all the risk. Given the significant component of systemic risk in agriculture such a model will require international reinsurance to be sustainable. The premium for such insurance is likely to be high, requiring subsidy from the government, especially for small and marginal farmers. In between these extremes there is possibility of public-private sharing of risks. In this case the government is likely to be at an informational disadvantage vis-à-vis the insurance companies which generate the policies. Hence, the risk sharing agreement will have to be appropriately designed to reduce problems of moral hazard and adverse selection. The agreement will also have to provide adequate measures to counteract the natural incentive of private insurers to target larger farmers and pay less attention to small and marginal farmers.

Cases of public private partnership in crop insurance

Spain and the US provide two models of public — private partnership.¹³

¹³ This is based on material from “Risk Management Tools for EU Agriculture”, European Commission, January 2001

Spain

Spain has a rich experience in agricultural insurance. Different systems with a varying degree of involvement of the state were tested between the 1920s and the 1970s. Overall success, however, remained limited and participation rates disappointing. The current system is built on that experience. It was set up in 1978 and continues to evolve. The basic feature of the system is that all insurable agricultural risks are covered by the private sector and all types of policies are subsidised by the state. Most policies are of the type "multiple risk". In the year 2000, about 30 per cent of Spanish producers participated in the system and about 30 per cent of crop and 10 per cent of animal production were covered.

The system is based on an intricate partnership between the private and the public sector. The customers of the system are farmers who can take out agricultural insurance individually or obtain coverage through co-operatives and professional organisations. Participation in the system is voluntary. Besides the customers, the key-players of the system are:

- ENESA (Entidad Estatal de Seguros Agrarios), attached to the Ministry of Agriculture, Fisheries and Food. Its president is the under-secretary of the Ministry and its director is appointed by the Minister of Agriculture. All stakeholders of the system, including farmers, are represented in this organization.
- AGROSEGURO (Agrupacion Española de Entidades Aseguradoras de los Seguros Agrarios Combinados), a pool of sixty private insurance companies which participate in a system of co-insurance. According to this system, the companies share the total risk underwritten in a given year by all members in proportion to their participation in the equity of AGROSEGURO. AGROSEGURO, on behalf of its members, assumes the day-to-day running of the programme, i.e. fixing and collecting premia, assessing losses, paying compensations, controlling farmers etc.
- CCS (Consortio de Compensación de Seguros), a public enterprise with own resources, operating as a re-insurer (under the control of the Ministry of Economy). Re-insurance by CCS is obligatory.

For any given year, ENESA takes the lead in publishing the annual plan. On the basis of the framework set out in the plan, AGROSEGURO fixes the detailed conditions for all insurance products, in particular the regionally differentiated premium rates which vary according to risk exposure and also include administrative and re-insurance costs. Once the conditions for the various products are set, they are then commercialised through the networks of the insurance companies, which are members of the pool of AGROSEGURO. Obligatory re-insurance is provided by CCS, additional private re-insurance is provided by private companies for viable lines for coverage going beyond the level provided by CCS.

Subsidies from the state and the regions are paid out by ENESA and channelled through AGROSEGURO to the insurance companies. Public subsidies amount to up to 41 per cent of the premium. For the period of 1980 — 1999 taken together the claims/premium ratio was 113 per cent. Losses are covered by the insurance industry and CCS. A key feature of the Spanish system is the participatory approach. All stakeholders are represented in ENESA, which enables taking strategic decisions and fixing the framework for the system (annual plans) in line with their needs.

US Crop Insurance

The Federal Crop Insurance Corporation (FCIC) was created in 1938 as a wholly owned government corporation. It is currently administered by the Risk Management Agency (RMA). The RMA was set-up in 1996 to administer the agricultural insurance programmes and other non- insurance-related risk management and education programmes that help support U.S. agriculture. The RMA regulates and promotes insurance programme coverage, sets standard terms — including premium rates — of insurance contracts, ensures contract compliance, and provides premium and operating subsidies. Crop insurance policies are delivered — sold, serviced, and underwritten — by private insurance companies.

Companies that qualify to deliver crop insurance must annually submit plans of operation for approval by FCIC. The plan provides the FCIC with information on the ability of the company to pay potential underwriting losses and on the allocation of the company's crop insurance business to the various risks sharing categories for the purpose of re-insurance. In addition to re-insurance, the companies are paid a subsidy by FCIC for administrative, operating, and loss adjustment costs. The levels of administrative and operating subsidy and the terms of re-insurance are specified in the Standard Reinsurance Agreement (SRA), which applies to all companies delivering FCIC-reinsured policies. Private companies share the risk with FCIC by designating their crop insurance policies to risksharing categories, called reinsurance funds. Companies retain or cede to FCIC portions of premia and associated liability (potential indemnities). FCIC assumes all the underwriting risk on the ceded business and various shares of the underwriting risk on the retained business, determined by the particular category and level of losses. Companies can further reduce their underwriting risk on retained business through private reinsurance markets. Insurance companies may develop new insurance products, which have to be submitted to the FCIC for approval. They can also offer private coverage without government support that supplements the crop insurance programmes.

9. Conclusions

The crop yield insurance scheme has been largely unsuccessful with low coverage and high claims to premium ratio. There are problems with both the design and implementation of the schemes.

There are problems in measuring crop yields in a timely and reliable manner. The integrity of the existing system of Crop Cutting Experiments is open to question. It also creates significant basis risk which can only be reduced at significant additional cost. The current premium rates are below actuarial levels as seen from the high claims to premium ratio. This makes the implementing agency dependent on the government for providing funds to meet claims and politicizes the process.

Most of the risk is borne by the government so that the implementing agency has little incentive to monitor and control moral hazard and adverse selection problems. Tying the insurance to crop loans makes the scheme completely dependent on the rural financial institutions for delivery and service. Given the generally poor state of these institutions delivery and service are likely to suffer in most areas.

The farm income insurance scheme is likely to face further problems of obtaining accurate and timely price data from local markets.

Rainfall insurance through a public private partnership arrangement can overcome several of the problems with the current crop insurance schemes. A system of private public partnership will provide the necessary impetus for efficiency and service quality. Rainfall insurance is essentially a yield insurance with rainfall being used as a proxy measure for yield. It will be easier to organize a system for obtaining timely and reliable rainfall information than yield information. Once the initial investment has been made in the infrastructure recurring costs are likely to be low. Moreover, given the general dependence of the country on rainfall such a system will have other payoffs in terms of calamity forecasting and relief. The basic infrastructure and the organization capacity in the form of the IMD are already available. However, this would need to be significantly upgraded. Finally, it is important to recognize that insurance is at best a coping mechanism, the cost of which depends upon the underlying fundamental risks. Before allocating resources to insurance it is important to evaluate if the same resources could be better spent on risk mitigation. Given the poor state of the irrigation systems and water resource management in general, the opportunities for risk mitigation appear quite promising.

Appendix 1

Insurance Regulatory and Development Authority (Obligations of Insurers to Rural Social Sectors) Regulations, 2000

In exercise of the powers conferred by section 32C read with section 32B of the Insurance Act, 1938, (4 of 1938), the Authority, in consultation with the Insurance Advisory Committee, hereby makes the following regulations, namely: -

1. Short title and commencement—(1) These regulations may be called the Insurance Regulatory and Development Authority (Obligations of Insurers to Rural or Social Sectors) Regulations, 2000. (2) They shall come into force from the date of their publication in the Official Gazette.
2. Definitions.— In these regulations, unless the context otherwise requires -
 - (a) “Act” means the Insurance Act 1938 (4 of 1938);
 - (b) “Authority” means the Insurance Regulatory and Development Authority established under the provisions of section 3 of the Insurance Regulatory and Development Authority Act, 1999 (41 of 1999);
 - (c) “Rural sector” shall mean any place as per the latest census which has—
 - (i) a population of not more than five thousand;
 - (ii) a density of population of not more than four hundred per square kilometer; and
 - (iii) at least seventy five per cent, of the male working population is engaged in agriculture.
 - (d) “Social sector” includes unorganised sector, informal sector, economically vulnerable or backward classes and other categories of persons, both in rural and urban areas;
 - (e) “Unorganised sector” includes self-employed workers such as agricultural labourers, bidi workers, brick kiln workers, carpenters, cobblers, construction workers, fishermen, hamals, handicraft artisans, handloom and khadi workers, lady tailors, leather and tannery workers, papad makers, powerloom workers, physically handicapped self-employed persons, primary milk producers, rickshaw pullers, safai karmacharis, salt growers, seri culture workers, sugarcane cutters, tendu leaf collectors, toddy tappers, vegetable vendors, washerwomen, working women in hills, or such other categories of persons.,
 - (f) “economically vulnerable or backward classes” means persons who live below the poverty line;
 - (g) “other categories of persons” includes persons with disability as defined in the Persons with Disabilities (Equal Opportunities, Protection of Rights, and Full Participation) Act, 1995 and who may not be gainfully employed; and also includes guardians who need insurance to protect spastic persons or persons with disability;
 - (h) All words and expressions used herein and not defined herein but defined in the Insurance Act, 1938 (4 of 1938), or in the Insurance Regulatory and Development Authority Act, 1999 (41 of 1999), shall have the meanings respectively assigned to them in those Acts.

3. Obligations.— Every insurer, who begins to carry on insurance business after the commencement of the Insurance Regulatory and Development Authority Act, 1999 (41 of 1999), shall, for the purposes of sections 32B and 32C of the Act, ensure that he undertakes the following obligations, during the first five financial years, pertaining to the persons in—

(a) rural sector,

(i) in respect of a *life insurer*; —

- (I) five per cent, in the first financial year;
- (II) seven per cent, in the second financial year;
- (III) ten per cent, in the third financial year;
- (IV) twelve per cent, in the fourth financial year;
- (V) fifteen per cent, in the fifth year;

of total policies written direct in that year;

(ii) in respect of a *general insurer*;-

- (I) two per cent. in the first financial year;
- (II) three per cent. in the second financial year;
- (III) five per cent. thereafter,

of total gross premium income written direct in that year.

(b) social sector, in respect of all insurers, —

- (I) five thousand lives in the first financial year;
- (II) seven thousand five hundred lives in the second financial year;
- (III) ten thousand lives in the third financial year;
- (IV) fifteen thousand lives in the fourth financial year;
- (V) twenty thousand lives in the fifth year;

Provided that in the first financial year, where the period of operation is less than twelve months, proportionate percentage or number of lives, as the case may be, shall be undertaken, Provided further that, in case of a general insurer, the obligations specified shall include insurance for crops.

Provided further that the Authority may normally, once in every five years, prescribe or revise the obligations as specified in Regulation 3.

4. Obligations of existing insurers. — (1) The obligations of existing insurers as on the date of commencement of IRDA Act shall be decided by the Authority after consultation with them and the quantum of insurance business to be done shall not be less than what has been recorded by them for the accounting year ended 3 March, 2000,

(2) The Authority shall review such quantum of insurance business periodically and give directions to the insurers for achieving the specified targets.

Appendix 2**State-wise gross irrigated and sown area (1999)**

(000 hectares)	Gross irrigated area	Gross sown area	% Gross irrigated / Gross sown area
Punjab	7,487	7,739	97%
Haryana	5,042	6,320	80%
Uttar Pradesh	17,676	24,236	73%
Tamil Nadu	3,635	6,627	55%
Andhra Pradesh	6,092	13,625	45%
Uttaranchal	551	1,306	42%
Jammu & Kashmir	447	1,081	41%
Manipur	75	216	35%
Gujarat	3,841	11,144	34%
Rajasthan	6,809	21,401	32%
Orissa	2,358	8,425	28%
Madhya Pradesh	5,567	20,482	27%
West Bengal	2,491	9,290	27%
Nagaland	73	286	26%
Karnataka	3,121	12,312	25%
Chhattisgarh	1,247	5,529	23%
Meghalaya	55	266	21%
Goa	34	171	20%
Himachal Pradesh	183	970	19%
Maharashtra	3,769	22,155	17%
Assam	572	3,941	15%
Kerala	421	2,917	14%
Arunachal Pradesh	36	250	14%
Tripura	60	488	12%
Mizoram	10	116	9%
India	75,954	192,620	39%

Source: India Harvest, CMIE

Appendix 3
South-west monsoon rainfall (mm)

Meteorological divisions	All years (1971-2002)			last 15 years (1988-2002)		
	Mean	Stddev	cv	Mean	Stddev	cv
India	832	94	11%	848	83	10%
Jammu and Kashmir	472	208	44%	554	239	43%
Saurashtra and Kutch	501	205	41%	484	196	41%
West Rajasthan	299	121	41%	316	118	37%
Gujarat Region	948	322	34%	1,095	313	29%
South interior Karnataka	635	207	33%	792	97	12%
Marathwada	672	205	31%	711	195	27%
Haryana, Chandigarh and Delhi	583	178	31%	562	203	36%
Punjab	533	155	29%	548	174	32%
Rayalaseema	433	125	29%	461	137	30%
Himachal Pradesh	1,006	283	28%	888	206	23%
East Rajasthan	613	158	26%	592	156	26%
Telangana	778	197	25%	800	186	23%
MadhyaMaharashtra	660	165	25%	773	110	14%
Coastal Andhra Pradesh	598	149	25%	651	141	22%
North interior Karnataka	564	128	23%	521	97	19%
Tamil Nadu and Pondicherry	321	67	21%	327	68	21%
Assam and Meghalaya	1,599	334	21%	1,841	242	13%
Vidarbha	923	191	21%	952	188	20%
Uttaranchal	1,234	254	21%	1,149	226	20%
East Uttar Pradesh	893	175	20%	865	90	10%
West Uttar Pradesh	761	149	20%	739	127	17%
West Madhya Pradesh	926	172	19%	896	175	19%
Kerala	1,832	338	18%	2,013	304	15%
Jharkhand	1,073	191	18%	1,093	171	16%
Bihar	1,015	178	18%	1,079	164	15%
Chattisgarh	1,109	193	17%	1,085	188	17%
Coastal Karnataka	3,147	508	16%	3,170	371	12%
Orissa	1,098	176	16%	1,092	199	18%
Konkan and Goa	2,600	372	14%	2,725	256	9%
Gangetic West Bengal	1,180	166	14%	1,172	128	11%
Sub-Himalayan WB and Sikkim	2,026	285	14%	2,072	347	17%
India total	33,539	3,812	11%	34,835	3,481	10%

Source: India Harvest, CMIE

Appendix 4
Monthly rainfall (1965-1994)

	Mean	Stddev	CV
Jan.	9	5	54%
Feb.	12	7	60%
Mar.	15	9	58%
Apr.	27	8	30%
May	51	14	29%
June	159	33	21%
July	265	33	12%
Aug.	247	32	13%
Sept.	161	33	21%
Oct.	72	25	35%
Nov.	33	19	57%
Dec.	14	9	68%
JF	21	10	47%
MAM	90	24	27%
JJAS	833	87	10%
OND	119	26	22%
Annual	1,066	102	10%

Abbreviation:

JF : January February.

MAM: March April May.

JJAS : June July August September.

OND: October November Decmber.

Note:

1. The values are approximate after 1990
2. The data are based on 306 rain gauge stations covering 29 subdivisions

Source:

Fertiliser Statistics, 2001-02, The Fertiliser Association of India & Past Issue. From Indiastat.com

Appendix 5

Variability of Annual Prices (In Percentage)

	Inter year variability			Intra year variability		
	1980s	1990s	Overall	1980s	1990s	Overall
WHEAT						
Australia	20.46	21.20	20.33	13.16	6.15	9.49
United States(US Gulf Pts*)	14.18	15.49	14.54	3.50	5.43	4.41
Argentina	19.31	25.76	22.16	7.61	8.48	8.00
Moga	5.48	11.61	9.10	6.00	7.22	6.61
Karnal	7.03	7.36	7.58	7.41	9.42	8.36
Hapur	6.98	10.44	9.15	8.01	7.75	7.89
Bahraich	9.93	11.94	11.17	8.25	7.88	8.08
RICE						
US (New Orleans)	18.25	12.53	15.12	3.33	3.70	3.52
Thailand	20.12	14.08	16.77	6.82	7.48	7.15
Kakinada	9.79	9.93	9.65	5.36	7.06	6.17
Patna	12.49	9.80	10.87	5.74	5.41	5.58
Karnal	17.19	29.67	24.22	4.73	5.07	4.89
Bangalore	8.73	8.95	8.63	4.52	3.83	4.19
SUGAR						
EUImportPrice*	10.96	5.51	8.44	3.14	2.17	2.64
USImportPrice*	14.48	5.25	10.44	2.60	1.78	2.17
Brazil	29.50	18.32	23.66	27.96	13.04	20.14
Bombay	8.11	8.63	8.41	4.27	4.45	4.35
Hapur	14.86	7.47	11.58	6.34	4.23	5.34
Calcutta	13.95	6.39	10.67	5.83	3.76	4.85
COTTON						
US(10 Markets)	12.34	20.29	16.68	4.94	6.01	5.50
Liverpool Index*	22.58	19.43	20.53	4.27	4.39	4.33
Egypt(LongStaple)	32.82	39.48	38.11	18.29	14.36	16.82
Egypt(LongMedium)	35.68	32.31	37.57	11.75	10.84	11.44
Abohar	21.60	31.25	26.43	6.60	14.88	10.74
GROUNDNUT OIL						
Any Origin (Europe)*	32.13	18.82	25.44	6.93	3.42	5.09
Chennai	14.07	15.54	14.89	7.63	7.39	7.51
Mumbai	14.98	14.83	14.45	6.85	7.05	6.93

Source: Volatility of Agricultural Prices — An Analysis Of Major International And Domestic Markets, C S C Sekhar, June 2003, Working Paper No. 103, Indian Council For Research On International Economic Relations, New Delhi, India.

Methodology and data

Monthly growth rates in nominal prices for each of the major commodities in the major markets have been calculated. The annual Intra-year variability has been calculated as the standard deviation of the 12 monthly growth rates in the year. Then the decadal average is calculated as the average of annual intra-year variability of all the years in the decade. For calculating the inter-year variability, the methodology is slightly different though. Firstly, the annual average prices are calculated as a simple average of the 12 monthly prices. Then the growth rates of annual prices are calculated as $\log(P_t / P_{t-1})$. The average inter-year variability of annual prices for the decade is then calculated as the standard deviation of the all the annual growth rates in the decade.

IFS data has been used for analysis of international sector. For few commodities where data is not available till 2001, data available for the latest year has been used (not earlier than 1999). For domestic prices, the publications — Agricultural Prices in India and Agricultural Situation in India- have been used.

The period of analysis for international sector is 1970-2001 while for domestic sector it is from 1980-2001.

Appendix 6**Unit of Insurance under the NAIS**

State	Unit of Insurance
Andhra Pradesh	Mandal/group of Mandals
Assam	Distt./Sub-division/Circle/Group of Circles
Bihar	Paddy - Block/Panchayat; Maize - District
Chhattisgarh	Tehsil
Goa	Taluka
Gujarat	Taluka
Himachal Pradesh	Tehsil/Sub-tehsil/Block
Jharkhand	Paddy - Block/Panchayat; Maize - District
Karnataka	Taluka / Hobli
Kerala	Zone comprising of 4-5 villages
Madhya Pradesh	Tehsil (planning for Patwari Halka for some crops for 2003-04)
Maharashtra	Circle/group of circles
Meghalaya	Community Development Block
Orissa	Block
Tamilnadu	Block
Uttar Pradesh	Sugarcane - District; other crops - Block
West Bengal	Block
Pondicherry	Commune Panchayat
A & N Islands	Gram Panchayat
Sikkim	District
Tripura	Block
Uttranchal	Tehsil-Hills, Block- Plains
Jammu & Kashmir	District

Source: AIC website aicofindia.nic.in

Appendix 7

Crops Covered in NAIS

	KHARIF (2002)	RABI (2002-03)
Andhra Pradesh	Paddy, Jowar, Bajra, Maize, Ragi, Korra, Black gram, Green gram, Red gram, Groundnut (I), Groundnut (UI), Castor, Sesamum, Sunflower, Sugarcane (Plant), Sugarcane (Ratoon), Cotton (I), Cotton (UI) and Red Chilly	Paddy, Jowar (UI), Maize, Ragi, Black gram, Green gram, Groundnut, Sunflower, Onion and Red chilly.
Assam	Ahu Paddy and Sali Paddy	Boro Paddy, Wheat, Rape & Mustard, Potato and Sugarcane
Bihar	Paddy, Maize, Banana and Red Chilly	Wheat, Lentil, Gram, Red gram, Rape seed & Mustard, Onion, Potato and Sugarcane
Chhattisgarh	Paddy (I.), Paddy (UI), Jowar, Maize, Kodokutki, Red Gram, Groundnut, Sesamum and Soyabean	Wheat (I), Wheat (UI), Gram, Linseed, Rape & Mustard and Potato
Goa	Paddy, Groundnut, Pulses, Ragi and Sugarcane	Paddy, Groundnut, Pulses and Sugarcane
Gujarat	Paddy, Jowar, Bajra, Maize, Black gram, Green gram, Beans, Red gram, Ragi, Castor, Groundnut, Sesamum and Cotton	Wheat (UI), Wheat (I), Gram, Summer Bajra, Summer Groundnut, Rape seed Mustard and Potato
Himachal Pradesh	Paddy, Maize and Potato	Wheat and Barley
Jharkhand	Paddy, Maize	Wheat, Gram, Red Gram, Lentil, and Mustard
Karnataka	Paddy(I), Paddy (RF), Jowar, Bajra, Maize (I), Maize (RF), Ragi, Red gram, Black gram, Green gram, Groundnut, Soyabean, Sunflower, Cotton (I), Cotton (RF), Sugarcane, Potato and Onion	Paddy, Jowar, Wheat (I), Ragi, Wheat (UI), Sunflower, Gram, Safflower, Groundnut, Maize (I), Blackgram, Greengram, Horsegram, Linseed and Potato
Kerala	Paddy	Rabi Paddy and Summer Paddy, Banana and Tapioca
Madhya Pradesh	Paddy (I), Paddy (UI), Jowar, Bajra, Maize, Kodo-kutki, Red gram, Groundnut, Soyabean, Sesamum, Cotton, Banana and Chilly	Wheat (UI), Wheat (I), Gram, Linseed, Rape seed & Mustard, Onion and Potato
Maharashtra	Paddy, Jowar, Bajra, Maize, Ragi, Groundnut, Niger, Soyabean, Sesamum, Sunflower, Green gram, Black gram, Red gram, Cotton and Onion	Summer Paddy, Wheat (I), Wheat (UI), Jowar (I), Jowar (UI), Gram, Sunflower, Summer Groundnut, Safflower and Onion
Meghalaya	Alu Paddy, Sali Paddy, Kharif Potato and Ginger	Boro Paddy, Rape & Mustard and Rabi Potato
Orissa	Paddy, Groundnut, Maize, Redgram, Niger and Cotton	Paddy, Groundnut, Mustard, Potato and Sugarcane
Tamilnadu	Paddy I, Jowar, Bajra, Ragi, Sesamum, Groundnut, Cotton, Red Gram, Turmeric, Onion and Potato	Paddy II, Paddy III, Jowar, Bajra, Ragi, Black gram, Horse gram, Groundnut, Cotton (I), Cotton (Rice fallow), Potato, Chilly, Tapioca and Banana
Uttar Pradesh	Paddy, Maize, Black gram, Red gram, Groundnut, Soyabean and Sugarcane	Wheat, Gram, Peas, Mustard and Potato.
West Bengal	Aman Paddy and Aus Paddy	Boro Paddy, Wheat, Mustard, and Potato.
Pondicherry	Paddy	Paddy II and Paddy III
A & N Islands	Paddy	No crops are notified
Sikkim	Paddy, Maize, Blackgram, Soyabean and Ragi	Wheat, Rape seed & Mustard, Barley, Urd, Ginger and Potato
Tripura	Aman Paddy and Aus Paddy	Boro Paddy and Potato
Uttaranchal	Not implemented	Wheat

Source: AIC website aicofindia.nic.in

Appendix 8

Comprehensive Crop Insurance Scheme (CCIS)

Summary of coverage until Kharif 1999

Total number of farmers covered	7,62,65,43 8
Total area covered (Hectares)	12,75,70,282
Total Sum-insured (Rs. Crores)	24949
Total insurance charges (Rs. Crores)	403.56
Total claim (Rs. Crores)	2303.45
Claims ratio	1: 5.71

Source: Report of the Working Group on Agricultural Credit, Co-operation and crop insurance, for formulation of the 10th Five Year Plan (2002-07), Planning Commission, India

CCIS: Statewise Premium & Claims: Origin & destination (1985-6-1999)

	Premium		Claims		Loss Ratio
	Rs. Cr.	%	Rs. Cr.	%	
Gujarat	64.45	16	1336.93	58	20.74
Vlaharashtra	60.42	15	253.55	11	4.19
AndhraPradesh	100.70	25	322.70	14	3.20
Others*	177.24	44	391.86	17	2.21

* include 22 states & UT's excluding Punjab, Haryana & North-Eastern states
Source: R.Parchure, "Varsha Bonds and Options", National Insurance Academy, Pune

CCIS: Cropwise Premiums and Claims: Origin & Destination (1985-6-1999)

	Premium	%	Claims		Loss Ratio
	Rs.Cr.	%	Rs.Cr.	%	
Paddy	217.52	54	576.26	25	2.65
Wheat	52.36	13	46.10	2	0.88
Groundnut	60.42	15	1221.68	53	20.22
Jowar	36.25	9	184.40	8	5.08
Bajra	24.16	6	184.40	8	7.63
Pulses	4.02	1	23.05	1	5.73
Others	8.04	2	69.15	3	8.60

Source: R.Parchure, "Varsha Bonds and Options", National Insurance Academy, Pune

Appendix 9.1**NAIS Business Statistics - Total for 7 seasons - Rabi 1999-2000 to Rabi 2002-2003**

STATE	FARMERS COVERED (000)	AREA (IN 000 HEC.)	SUM INSURED Rs. crores	PREMIUM Rs. crores	SUBSIDY Rs. crores	TOTAL CLAIMS Rs. crores	Claims / Premium Ratio
Andhra Pradesh	5,592	8,016	6,297	170	45	359	2.11
Assam	14	12	13	0	0	0	
Bihar	391	429	317	7	3	23	3.29
Chhatisgarh	1,579	3,791	764	20	3	164	8.20
Goa	3	6	2	0	0	0	
Gujarat	3,641	7,680	5,740	225	25	1,653	7.35
Himachal Pradesh	75	43	32	1	0	5	5.00
Jharkhand	21	24	16	0	0	0	
Karnataka	2,059	3,206	2,235	68	10	439	6.46
Kerala	121	104	111	2	1	6	3.00
Madhya Pradesh	4,561	11,652	2,555	83	10	373	4.49
Maharashtra	7,865	9,043	5,302	186	29	312	1.68
Meghalaya	6	6	4	0	0	0	
Orissa	3,227	3,338	2,411	63	19	355	5.63
Sikkim	1	0	1	0	0	0	
Tamil Nadu	362	627	466	9	2	51	5.67
Tripura	1	1	1	0	0	0	
Uttar Pradesh	2,670	3,840	1,940	38	10	42	1.11
Uttranchal	6	9	4	0	0	0	
West Bengal	1,623	869	910	22	8	48	2.18
A & N Islands	0	1	0	0	0	0	
Pondicherry	6	10	10	0	0	1	
TOTAL (7 seasons)	33,824	52,706	29,129	897	164	3,832	4.27
Season - All India							
Rabi 1999-2000	580	781	356	5	2	8	1.60
Kharif 2000	8,409	13,220	6,903	207	47	1,222	5.90
Rabi2000-01	2,092	3,111	1,603	28	8	59	2.11
Kharif 2001	8,696	12,888	7,502	262	48	493	1.88
Rabi2001-02	1,955	3,146	1,498	30	8	65	2.17
Kharif 2002	9,765	15,523	9,429	327	45	1,792	5.48
Rabi 2002-03	2,327	4,038	1,838	39	7	193	4.95
7 seasons total	33,824	52,706	29,129	897	164	3,832	4.27

Source: Agriculture Insurance Company

Appendix 9.2

**NAIS Business Statistics -
Cropwise total for 7 seasons - Rabi 1999-2000 to Rabi 2002-2003
Source: Agriculture Insurance Company**

Crop	Farmers covered (000)	Area in Hec. (000)	Sum-Insured Rs. crores	Premium Rs. crores	Claims Rs. crores	Claims / Premium Ratio
Food crops and oilseeds						
Groundnut	4,581	7,973	5,931	203	1,375	6.77
Paddy	12,516	17,303	9,919	242	1,049	4.34
Soyabean	2,105	5,380	1,339	47	245	5.20
Wheat	2,647	5,780	1,445	22	84	3.82
Maize	638	636	411	10	70	6.92
Horsegram	541	1,273	284	6	58	9.25
Jowar	1,541	1,563	517	13	57	4.29
Redgram	866	1,128	530	14	45	3.32
Bajra	870	1,378	354	13	43	3.45
Blackgram	316	348	127	3	38	10.93
Greengram	354	408	113	3	29	9.41
Castor	158	183	110	4	15	3.93
Other crops	470	840	278	8	16	2.05
Total	27,601	44,194	21,359	588	3,125	5.31
Annual commercial and horticultural crops						
Cotton	3,169	5,540	3,202	216	488	2.26
Sugarcane	2,255	2,286	3,493	50	111	2.19
Potato	593	477	805	26	87	3.32
Onion	116	107	138	7	16	2.11
Chilly	71	84	101	7	3	0.44
Other crops	16	18	31	1	0	0.03
Total	6,220	8,512	7,770	308	704	2.29
GRAND TOTAL	33,822	52,706	29,129	896	3,829	4.27

Source: Agriculture Insurance Company

Appendix 9.3**NAIS - Gujarat**

	FARMERS COVERED (000)	AREA (IN 000 HEC.)	SUM INSURED Rs.crores	PREMIUM Rs.crores	SUBSIDY Rs.crores	TOTAL CLAIMS Rs. Crores	FARMERS BENEFIT-TED (000)
RABI 1999-2000	15	1	1	0	0	0	0
KHARIF 2000	1,118	2,756	1,615	62	9	770	977
RABI2000-01	32	63	34	1	0	3	8
KHARIF 2001	1,254	2,469	1,978	74	8	149	1,670
RABI2001-02	26	44	30	1	0	1	11
KHARIF 2002	1,169	2,280	2,028	88	8	726	671
RABI2002-03	27	43	35	1	0	2	8
KHARIF 2003	1,016	2,183	1,910	99	6	0	0

Source: Agriculture Insurance Company

Note: Kharif 2003 data not complete

Gujarat groundnut yield and area sown

Year ending March	Area sown '000 Hectares	Yield Kg./Hectare
1990	2,038	819
1991	1,702	619
1992	1,942	360
1993	1,884	1,098
1994	2,053	330
1995	1,914	1,204
1996	1,903	540
1997	1,835	1,335
1998	1,926	1,358
1999	1,941	1,328
2000	1,827	393
2001	1,745	395
2002	1,923	1,410

Source: India Harvest, CMIE

Appendix 10

Rice yield (Kg/hectare) summary statistics

	All years (1971-2002)			Last 20 (1983-2002)			last 15(1988-2002)		
	Mean	Stddev	Cv	Mean	Stddev	Cv	Mean	Stddev	Cv
Punjab	2,972	489	16%	3,278	191	6%	3,317	199	6%
Haryana	2,403	391	16%	2,587	213	8%	2,604	228	9%
Uttar Pradesh	1,406	503	36%	1,731	323	19%	1,880	211	11%
Uttaranchal	1,776	244	14%	1,902	158	8%	1,968	102	5%
Bihar	1,115	264	24%	1,240	259	21%	1,324	227	17%
Orissa	1,088	240	22%	1,208	215	18%	1,266	197	16%
West Bengal	1,674	435	26%	1,932	345	18%	2,095	189	9%
Assam	1,161	176	15%	1,261	145	12%	1,317	122	9%
Jharkhand	878	191	22%	944	196	21%	982	202	21%
Gujarat	1,233	313	25%	1,331	263	20%	1,387	250	18%
Maharashtra	1,427	254	18%	1,509	185	12%	1,562	161	10%
Goa	2,158	437	20%	2,433	235	10%	2,517	146	6%
Madhya Pradesh	741	154	21%	775	132	17%	799	118	15%
Chhattisgarh	978	214	22%	1,081	177	16%	1,128	162	14%
Andhra Pradesh	2,140	457	21%	2,431	286	12%	2,554	210	8%
Karnataka	2,076	271	13%	2,202	242	11%	2,292	210	9%
Kerala	1,773	232	13%	1,909	185	10%	1,989	138	7%
Tamil Nadu	2,547	601	24%	2,893	493	17%	3,124	276	9%
India	1,524	322	21%	1,728	221	13%	1,828	144	8%

Groundnut yield summary statistics

	All years (197 1-2002)			Last 20 years (1983-2002)			last 15 years (1988-2002)		
	Mean	Stddev	cv	Mean	Stddev	Cv	Mean	Stddev	cv
Uttar Pradesh	760	160	21%	802	151	19%	838	131	16%
Rajasthan	765	229	30%	877	200	23%	938	179	19%
Orissa	1,200	212	18%	1,162	214	18%	1,095	205	19%
West Bengal	1,114	356	32%	1,206	249	21%	1,297	114	9%
Gujarat	811	384	47%	805	432	54%	860	472	55%
Maharashtra	890	239	27%	1,027	173	17%	1,094	125	11%
Madhya Pradesh	780	199	25%	874	187	21%	954	131	14%
Chhattisgarh	797	188	24%	894	168	19%	967	110	11%
Andhra Pradesh	865	150	17%	888	155	17%	907	164	18%
Karnataka	691	111	16%	708	122	17%	746	110	15%
Tamil Nadu	1,286	298	23%	1,427	283	20%	1,536	232	15%
India	898	142	16%	952	137	14%	993	124	13%

Source: yield data from India Harvest, CMIE
Cv: Coefficient of variation = (Mean/Std Dev)* 100

Appendix 11**Yield statistics - All India**

	Rice	Wheat	Jowar	Bajra	Groundnut	Cotton	Sugarcane
Correlation Coefficient (1970-2003)							
Rice	1.00	0.98	0.74	0.72	0.65	0.83	0.96
Wheat		1.00	0.74	0.68	0.60	0.83	0.94
Jowar			1.00	0.59	0.62	0.84	0.73
Bajra				1.00	0.78	0.54	0.64
Groundnut						1.00	0.59
Cotton						1.00	0.84
Sugar cane							1.00
All 34 years (1970-2003)							
Mean	1,521	1,981	710	556	890	186	59,720
Stdev	328	525	131	149	142	44	7,732
Cv	22%	27%	18%	27%	16%	24%	13%
Last 20 years (1984-2003)							
Mean	1,760	2,363	780	626	955	214	65,207
Stdev	191	305	102	146	132	33	4,525
Cv	11%	13%	13%	23%	14%	15%	7%

Source: yield data from India Harvest, CMIE

Cv: Coefficient of variation = (Mean/Std Dev)* 100

Appendix 12
Calamity Relief Fund during 2000-2005
(Rs. in crores)

STATE	2000-01	2001-02	2002-03	2003-04	2004-05	TOTAL 2000-05
Andhra Pradesh	198	208	218	229	241	1,094
Arunachal Pradesh	12	13	13	14	15	66
Assam	101	107	112	117	123	561
Bihar	124	130	136	143	150	683
Goa	1	1	1	1	2	7
Gujarat	161	169	178	187	196	892
Haryana	81	85	90	94	99	449
Himachal Pradesh	43	46	48	50	53	240
Jammu & Kashmir	35	37	38	40	42	193
Karnataka	75	78	82	86	91	412
Kerala	67	71	74	78	82	372
Madhya Pradesh	90	95	99	104	110	498
Maharashtra	157	165	173	182	191	869
Manipur	3	3	3	3	3	16
Meghalaya	4	4	4	5	5	22
Mizoram	3	3	3	3	4	16
Nagaland	2	2	2	2	2	11
Orissa	109	115	121	127	133	605
Punjab	123	129	135	142	149	678
Rajasthan	207	217	228	240	252	1,144
Sikkim	7	7	8	8	8	38
Tamil Nadu	103	108	113	119	125	567
Tripura	5	5	6	6	6	29
Uttar Pradesh	179	188	197	207	217	987
West Bengal	101	106	111	117	123	559
Total	1,992	2,092	2,196	2,306	2,421	11,008

Source: National Disaster Management, Ministry of Home Affairs

Appendix 13**Releases from National Fund for Calamity Relief 1995-96 TO 1999-2000****(Rs. in Crore)**

	1995-96	1996-97	1997-98	1998-99	1999-2000	Total
Andhra Pradesh	0	163	42	27	75	307
Arunachal Pradesh	0	13	0	13	0	26
Assam	0	21	0	60	0	81
Bihar	0	28	10	11	38	88
Gujarat	0	0	87	55	55	197
Haryana	39	0	0	13	0	53
Himachal Pradesh	12	11	25	0	0	48
Jammu & Kashmir	18	0	0	0	73	92
Karnataka	0	0	22	50	17	89
Kerala	0	0	13	0	0	13
Madhya Pradesh	0	0	68	35	39	142
Meghalaya	0	10	0	0	0	10
Mizoram	5	0	0	0	6	11
Orissa	26	55	4	0	828	913
Punjab	16	0	0	0	0	16
Rajasthan	0	21	0	22	103	146
Sikkim	0	6	7	8	0	20
Tamil Nadu	0	25	0	0	0	25
Tripura	0	0	0	5	5	10
Uttar Pradesh	0	0	0	131	17	148
West Bengal	0	21	0	66	30	117
Manipur	0	0	0	0	5	5
Total	117	373	277	497	1,291	2,555

Source: National Disaster Management, Ministry of Home Affairs

Appendix 14

**REVISED LIST OF ITEMS AND NORMS OF EXPENDITURE FOR ASSISTANCE
FROM CALAMITY RELIEF FUND (CRF) AND NATIONAL CALAMITY
CONTINGENCY FUND (NCCF) FOR THE PERIOD 2000-2005 (MHA letter No.32-3/2003-
NDM.I Dated the April 23, 2003)**

ITEMS	NORMS OF EXPENDITURE FOR ASSISTANCE FROM CRF AND NCCF
Assistance to small and marginal farmers for -	
(a) Desilting etc. (b) Removal of debris in hill areas, and (c) Desilting/Restoration/Repair of fish farms	25% and 33-1/3% to small farmers and marginal farmers respectively on the basis of NABARD pattern subject to ceiling of Rs.5,000/- per hectare.
(d) Agriculture input subsidy where crop loss was 50% and above.	
(I) For agriculture crops, horticulture crops and annual plantation crops	Rainfed areas Rs.1000/- per hectare —Rs.2500/- per hectare in area with assured irrigation
(II) Perennial crops	Rs. 4,000 per hectare
(III) Assistance to senculture farmers	Rs. 2000/- Per hectare for muga Rs. 1500/- Per hectare for Eri and Mulberry
(e) Loss of substantial portion of land caused by landslide, avalanche, change of course_of rivers.	Rs. 10,000/- per hectare
Animal Husbandry Assistance to small and marginal farmers/ agricultural labourers	
(a) For replacement of draught animals, milch animals or animals for haulage or for livelihood	As per pattern of subsidy under Swarnjayanti Gram Swarozgar Yojana for small and marginal farmers.
(b) For provision of fodder/ fodder concentrate	Large animals — Rs.12.00 per day, Small animals — Rs.6.00 per day
(c) Procurement, storage and movement of fodder	To be assessed by NCCM
(d) Movement of useful cattle to other areas	To be assessed by the NCCM for NCCF/by State level Committee for CRF

Source: National Disaster Management, Ministry of Home Affairs

Appendix 15**Index weights for Mahbubnagar groundnut**

Sub periods Commencing	Ending	Weights-1	Period Rainfall index received in the sub-period (subject to cap of 200 mm per day)-2	Weighted Period rainfall index(1*2)
11/May	20/May	99%		
21/May	30/May	99%		
31/May	9/June	99%		
10/June	19/June	97%		
20/June	29/June	97%		
30/June	9/July	0%		
10/July	19/July	99%		
20/July	29/July	99%		
30/July	8/August	99%		
9/August	18/August	39%		
19/August	28/August	39%		
29/August	7/September	39%		
8/September	17/September	99%		
18/September	27/September	99%		
28/September	7/October	99%		
8/October	17/October	99%		

Appendix 16**Number of Crop Cutting Experiments (CCE) Experiments Planned under General Crop Estimation Surveys (GCES) During 2000-2001**

Crops Type/Crop	No. of Experiments Planned		
	KHARIF	RABI	TOTAL
FOOD CROPS			
Paddy	99,840	21,255	121,095
Wheat		61,963	61,963
Jowar	15,202	13,218	28,420
Bajra	13,292		3,292
Maize	17,704	—	17,704
Ragi	7,500	—	7,500
Barley		3,364	3,364
Gram	—	18,499	8,499
Sugarcane	19,801	—	19,801
NON FOOD CROPS			
Groundnut	17,482	4,291	21,773
Sesamum	8,556	3,498	12,054
Castor	1,414	—	1,414
Rapeseed & Mustard	—	16,374	16,374
Linseed	—	5,666	5,666
Cotton	11,668	—	11,668
Jute	4,501	—	4,501
Mesta	706	—	706
Other Crops (Kharif& Rabi)			104,176
TOTAL ALL CROPS			469,970

Source: Agricultural Statistics At A Glance - 2003, Ministry of Agriculture

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