CHAPTER-I
INTRODUCTION

Agriculture is the primary sector of economy and hence basis of the supply of food for the human population. It is one the most important human occupations, its origin dating back to the Neolithic Revolution, more the 10000 years ago.\(^1\) In fact, engagement in farming activities is considered the beginning of human civilization and an experience in group living. Since then, agriculture has been developed with sustainability. In the last three centuries, in the field of agriculture, great amount of research has continuously been advancing in response to the varied demands of human society due to progressively increasing population. Progress, however, has not been as smooth as desired: the world has witnessed many food crises and man has continuously been battling against hunger in a bid to achieve food security. Food Security exists “When all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”.\(^2\) Every generation has suffered hunger, famines have occurred at many times, and hence feeling of food insecurity has always been part of human history. The endeavours to achieve food security to avoid hunger and meet famine conditions are as old as civilization itself.

In a world dominated by a productionist paradigm that sprang from the industrial revolution and aggressively continued thereafter, global agricultural production has come to be characterized by massive amounts of industrial and capital inputs, highly specialized monocrop production, rapidly increasing farm sizes, and a vast reduction in the amount of labour required to operate farms. This industrial model of agriculture is designed to maximize produce and optimize profits by increasing productive capacity (through mechanization, tissue culture and other scientific techniques) and reducing costs for both producers and consumers. Although it is widely practised around the world, and is supported by powerful industry-lobbies and the governments, yet this model is also being criticized by increasing numbers

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of people who question the degree to which it is socially, environmentally, and even economically sustainable.\(^3\)

Over the past six decades, the world agriculture has become considerably more efficient. Improvements in production systems and crop and livestock breeding programmes have resulted in doubling of food production while increasing the amount of cultivated agricultural land mass by just 10 percent. However, currently felt climate change is expected to exacerbate the existing challenges faced by agriculture. Estimates\(^4\) show that world population will grow from the current 6.7 billion to 9 billion by 2050 with most of the increase occurring in South Asia and sub-Saharan Africa. Taking into account the changes in the composition and level of consumption associated with growing household incomes, FAO estimates that feeding the world population will require a 70 percent increase in total agricultural production.\(^5\)

Historically, we see that agriculture has played a key role in kick-starting economic growth and reducing poverty and hunger in many developing countries. Moreover, most of the countries that have failed to launch agricultural revolution by application of science and technology research results remain still trapped in poverty, hunger, and economic stagnation. But the conventional assertion that developing countries should continue to invest in their agricultural development being their core strength, and particularly in food staples and small farms, is being challenged. In an era of globalization, trade liberalization, changing market structures and demand pattern, and ample world food supplies, a new breed of agricultural skeptics argue that poor countries should now downplay the importance of food staples and small farms and focus instead on commercial farms, high-tech and higher-value agriculture, and rural income source diversification through migration and nonagricultural development. Some even advocate that poor countries take advantage of the global glut in food staples to leap frog agricultural development altogether. Yet others note that rapid growth in urban–rural linkages and rural income diversification are making

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\(^4\) These estimates refer to a specific baseline scenario which excludes, among other elements, the effects of climate change on production. For more details see FAO (2006).

agriculture largely irrelevant for the rural poor. These arguments have merit, but they can also trigger simplistic and generalized conclusions that overlook the diverse needs and opportunities in the developing countries today. Not only are there still many viable opportunities for small farms, but the kinds of state withdrawal from agriculture being promoted by some could lead to a massive and premature exodus of small farms that would overwhelm the capacity of many developing countries to cope with. Agriculture can contribute to spurring growth, reducing poverty, and sustaining the environment. GDP growth in agriculture is at least twice as effective in reducing poverty as nonagricultural GDP growth.6

Agriculture remains an important sector of economy in many developing countries. It contains a promise of growth and senses as a potential source of investment opportunities for the private sector. Two-thirds of the world’s agriculture value added is estimated to be created in developing countries.7 In agriculture-based economies, which include most of Sub-Saharan Africa, agriculture generates 29 percent of GDP on average. In transforming countries in which agriculture is no longer a major source of economic growth, which include most of South and East Asia and the Middle East and North Africa the contribution of agriculture to GDP is much lower (Table 1.1). Nearly half of the world’s population, some 2.9 billion people, lives in rural areas. Agriculture is the main source of livelihood for an estimated 86 percent of these people.8 Agriculture provides employment to 68 percent of the population in agriculture-based countries and 48 percent in transforming economies. About 94 percent of rural households depend upon their agricultural activities in agricultural-based countries for their living; this proportion falls to 76 percent in transforming economies. It is heartening to note that many developing countries have affected major shifts in their agricultural policies, oriented towards modernization of the agricultural sector over the past two decades. The change in policy contributed to more sustainable growth of the sector, though growth was slower than in nonagricultural sectors, except in agriculture-based countries.

8 Ibid.
Agriculture can contribute to spurring of growth, reducing poverty, and sustaining the environment. GDP growth in agriculture is at least twice as effective in reducing poverty as nonagricultural GDP growth. The growth strategy for most agriculture-based economies should, therefore, be anchored in improving the productivity of the agricultural sector, particularly of food staples. Agricultural risk management, including agricultural insurance, can contribute to raising the productivity of agriculture by helping farmers and herders invest in more productive, but sometimes riskier, agricultural business activities.

Agriculture sector is vital for the food and nutritional security of India. The sector remains the principal source of livelihood for more than 58% of the population though its contribution to the national GDP has declined to 14.2% due to high growth experienced in industries and services sectors. Compared to other countries, India faces a greater challenge, since with only 2.3% share in world’s total cultivated land area, it has to ensure food security of its population which is about 17.5% of the world population. This puts excessive pressure on land and fragmentation of land holdings due to increasing trend to have nuclear families. Against the backdrop of the burgeoning population’s demands for food grains, degrading natural resource base, emerging concerns of climate change and other socio-political and economic challenges, the Department of Agriculture and Cooperation (DAC) has focused on mobilizing higher investment in agriculture, bridging yield gaps that exist across the states/regions, timely and adequate supply of quality inputs, and providing adequate support services to the farmers to make agriculture a remunerative vocation on a sustainable basis. Increasing agricultural production, with limited natural resources,
in a sustainable manner, for ensuring food and nutritional security and providing income security to farmers, are the major challenges before the Government.

Agriculture sector had touched a growth rate of 4.4% in the second quarter of 2010-11 thereby achieving an overall growth rate of 3.8% during the first half of 2010-11. The sector witnessed a growth of 5.1 per cent in 2005-06, 4.2 per cent in 2006-07, 5.8 per cent in 2007-08, (-) 0.1 percent in 2008-09 at 2004-05 prices. The low growth rate of 0.4 percent recorded by this sector in 2009-10 was mainly due to poor rainfall in 2009. As per the Advance Estimates (AE) of Central Statistical Organization (CSO) for the year 2010-11, the agricultural sector contributed about 14.2 per cent to the GDP, at 2004-05 prices. There has been a continuous decline in the share of agriculture in the GDP from 17.4 percent in 2006-07 to 14.2 percent in 2010-11 as per Advance Estimates at 2004-05 prices. Falling share of agriculture in GDP is an expected outcome in a fast growing and structurally changing economy.10

**Investment in Agriculture:**

As a result of the initiatives taken by the Government, the share of total investment in Gross Capital Formation in agriculture and allied sectors has been going up in recent years. During 2004-05 to 2009-10, the total investment in agriculture increased in the range of 7.5% to 7.7% per annum. This trend continued in subsequent years. The Plan outlay on various schemes of the DAC has increased substantially from Rs. 9865.58 crore in 2008-09 (RE) to Rs.17254 crore in 2010-11 (BE). The increase is mainly due to substantially higher allocation under Rashtriya Krishi Vikas Yojana (RKVY), which was launched in 2007-08 with the aim to boost agricultural growth rate and incentivize the states to increase public investment in agriculture and allied sectors. Actual expenditure during 10th Five-Year Plan was Rs.14952.36 crore against an approved outlay of Rs.16093.32 crore. Out of total outlay of Rs.66577.00, crore for the Eleventh Plan, the anticipated expenditure up to 2010-11 would be Rs.44413.01 crores.

**Agriculture GDP:**

As one of the world’s largest agrarian economies, the agriculture sector contributed approximately 14.6% of India’s GDP (at 2004-05 prices) during 2009-10. Gross

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10 Annual Report, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi, March, 2011, p. 3.
Domestic Product (GDP) of Agriculture and Allied Sectors and their share in total GDP of the country during the last 3 years including of the current year, at 2004-05 prices, is as follows Table (1.2 and 1.3):

<table>
<thead>
<tr>
<th>Table 1.2</th>
<th>Contribution of Agriculture and Allied Activities During 2006-2011 (Rs. Crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2006-07</td>
</tr>
<tr>
<td>GDP of Agriculture and Allied Sectors</td>
<td>619190</td>
</tr>
<tr>
<td>Percent to total GDP</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Source: Central Statistical Organization, Ministry of Statistics and Programme Implementation, Govt. of India.

Growth (over the previous year) in the total GDP and that in the GDP of Agriculture and Allied Sectors at 2004-05 prices is given below:

<table>
<thead>
<tr>
<th>Table 1.3</th>
<th>Total GDP Growth and Growth of Agriculture and Allied Sectors During 2005-06 to 2010-11 (%growth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Total</td>
</tr>
<tr>
<td>2005-2006</td>
<td>9.5</td>
</tr>
<tr>
<td>2006-2007</td>
<td>9.6</td>
</tr>
<tr>
<td>2007-2008</td>
<td>9.3</td>
</tr>
<tr>
<td>2008-2009</td>
<td>6.8</td>
</tr>
<tr>
<td>2009-2010</td>
<td>8.0</td>
</tr>
<tr>
<td>2010-2011</td>
<td>8.6</td>
</tr>
</tbody>
</table>


Credit and Insurance

Agricultural credit plays an important role in maintaining agricultural production by allowing producers to meet their credit needs during the entire cycle of crop production and at the same time provides funds for investment purposes (for land development). With increased commercialization of agriculture and increase in the use of modern high-tech inputs, the amount and share of purchased inputs in the total production is increasing rapidly. Besides, private investment in different types of assets like irrigation equipments, farm machinery, and land improvements are required for efficient production and maintaining faster agricultural output growth. Farmers have to avail of credit facilities either from institutional sources or from non-institutional sources like private money lenders. Loans from non-institutional sources though, very common, are often exploitative, with very high interest rate,
and due to such sources, the borrowers often fall into debt trap. Realizing these difficulties, the government has initiated several measures to galvanize the institutional credit system to make it more responsive to the needs of farmers.

The objective of the Agricultural Credit Policy in India since independence has been gradual replacement of moneylenders by institutional sources and lowering of interest rates. Till major banks were nationalized, cooperative institutions were the only source of institutional credit in rural areas. Since nationalization, scheduled commercial banks and regional rural banks (RRBs) have also been part of the formal credit system. The share of commercial banks has substantially increased from 53 percent in 2000-01 to 74.5 percent in 2010-11 (Figure 1.1) As percentage of agricultural GDP, institutional credit to agriculture has increased from 2.56 percent in 1970–1971 to 7.11 percent in 1980–1981 and 11.47 percent in 2000–2001, and 32.21 percent in 2010-11, though studies do suggest asymmetries in distribution of credit across farm size and across regions. But small farmers continue to resort to informal lenders (despite Kisan credit cards), as the current system of institutional credit to farmers suffers from non-farmer friendly practices, delays in credit delivery and collateral problems. Keeping in view the importance of flow of credit to agriculture, in particular to the smaller borrowers who may not have the necessary assets to offer as collateral security, the banks have been advised to waive margin requirement and security requirements for agricultural loans up to Rs.100, 000. The usual practice of producing “No Dues Certificate” from cooperatives and banks operating in the area for small loans to SF/MF, share croppers, etc. has been dispensed with and instead banks have been instructed to obtain self declaration from the borrowers.

Figure 1.1
Sources of Institutional Agricultural Credit (Percentage)

| Source: Department of Agriculture and Cooperation (2012). |
One of the major challenges in the sector has been the assurance of the provision of timely and adequate credit to the farmers. An innovative strategy conceived in 1999 by the GOI was creation and issue of the Kisan Credit Cards (KCC) through which farmers could avail short-term loans for crops from banks. The scheme was initiated in consultation with the Reserve Bank of India and National Bank for Agricultural and Rural Development (NABARD) and by the end of October, 2011, 10.78 crore KCCs were issued to eligible farmers all over India. All cooperative banks, scheduled commercial banks and regional rural banks were given annual targets and their progress was monitored at every step by NABARD.

The Kisan Credit Card (KCC) is essentially a type of revolving cash credit facility with Withdrawals and repayments to meet the production credit needs, cultivation expenses and the contingency expenses of the farmers. Recently, banks have also extended credit towards working capital requirements for other activities such as cattle breeding and poultry farming through this scheme. Each farmer is given a passbook and is sanctioned a credit limit, which can be modified depending on his performance and repayment record, thereby maintaining a working relationship between him and the bank. While the limit of credit is decided on the basis of operational landholding, cropping pattern and scale of operations, the full year's credit requirement of the borrower is taken care of and each card is valid up to five years. With minimum paper work and simplification of documentation for withdrawal of funds from the bank, not only has availability of credit been made easier but also the system has been made straightforward to operate and farmers have been given sufficient freedom to decide how to use their credit. The card also carries some insurance cover at a nominal premium.

The implementation of the scheme has resulted in an increase in the flow of credit to the agriculture sector and a substantial reduction in borrowing from the informal sector for short-term needs. The programme has benefited both farmers and bankers as there has been a significant saving in time and cost of credit delivery, reduction in transaction costs, better recoveries and reduction in the workload of bank branches. However, the sanctioning of lower credit limits, low awareness levels about insurance features and the tendency to treat the card as a term loan facility rather than as a cash credit facility still remain areas of concern.
Banks have now begun taking advantage of the popularity of the cards by enhancing the features of the card in making the card ATM-compatible, issuing chip-based smart cards which will contain embedded information pertaining to land records, limit sanctioned, amount withdrawn against bank account, etc. With near-universal coverage, the Kisan Credit Card (KCC) has met all its objectives and is on its way to becoming a powerful tool in consolidating the banker-farmer relationship.

NABARD has formulated a scheme to provide loans to tenant farmers and oral lessees for raising crops. NABARD would facilitate the formation and financing of groups of Tenant Farmers by organizing them into Tenant Farmers Groups (TFGs). The objective of the scheme is to provide crop loans through institutional agencies to Tenant Farmers, Oral Lessees and share croppers, who are not being extended credit support due to their inability to provide tangible securities and/or are unable to produce the documents regarding their rights on the land. NABARD would extend refinance support to RRBs and State Cooperative Banks (SCBs)/District Central Cooperative Banks (DCCBs) to the extent of 100 percent of the loans provided by the banks to the TFGs. NABARD is facilitating implementation of SHG-Bank Linkage Programme through Commercial Banks, RRBs, Cooperative Banks and Self Help Promoting Institutions (SHPIs), like NGOs, State Government departments, Farmers Clubs, Individual Rural Volunteers, etc since 1992 onwards. The programme basically aims at linking the self help groups with the formal banking structure in the country to obtain the credit for meeting their emergent production and consumption needs. On the basis of recommendations made by the Vaidyanathan Committee Task Force, the government of India had approved a Revival Package for Short Term Cooperative Credit Structure (STCCS) aimed at making it a well managed and vibrant structure to best serve the credit needs of Rural India in the best possible way.

The revival Package envisages an outlay of Rs.13,597 crore for recapitalization of STCCS, capacity building & training and computerization subject to legal reforms by the State Governments. The Revival Package seeks namely, to (i) provide financial assistance to bring the system to an acceptable level of health; (ii) introduce legal and institutional reforms necessary for their democratic, self-reliant and efficient functioning; and (iii) take measures to improve the quality of
management as an integrated package. As on May, 2011, an amount of Rs.8993.08 crore has been released by NABARD as Government of India’s share for recapitalization of 53,026 Primary Agricultural Credit Societies (PACS).

The Government of India's Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS), 2008 aimed at de-clogging the lines of credit that were choked due to the debt burden on the farmers and to entitle these farmers for fresh credit. All agricultural loans disbursed by Public Sector Banks, Private Sector Banks, Cooperative Banks, Local Area Banks and Regional Rural Banks between 1st April, 1997 to 31 March, 2007 to farmers, overdue as on 31 December, 2007 and remaining unpaid up to 28th February, 2008 were eligible for Debt Waiver and Debt Relief. For marginal farmers (i.e., having land holdings up to 1 hectare) and small farmers (1-2 hectare), there was complete waiver of all loans that were overdue on 31 December, 2007 and which remained unpaid until 29 February, 2008. In respect of other farmers, there was a provision for ‘One-Time Settlement’ (OTS) scheme for all loans that were overdue on December 31, 2007 and which remained unpaid as on February 29, 2008. Under the OTS, a rebate of 25 per cent was allowed against payment of the balance of 75 percent. In case of the revenue districts covered under DPAP, DDP and PM’s special relief package, other farmers were given an OTS rebate of 25 percent of the eligible amount or Rs.20, 000 whichever was higher subject to the condition that the farmer paid the balance of the eligible amount. Debt Waiver portion of the Scheme was closed on 30th June 2008. As per the provisional figures, a total of 3.01 crore small and marginal farmers and 67 lakh 'other farmers' had benefited from the Scheme involving debt waiver and debt relief of Rs. 65.318.33 crore. Against this, the total amount of claims eligible for reimbursement from the government after the permitted inclusions and exclusions in the Guidelines was expected to be about 15 percent lower than the above figure because lending institutions were neither to claim from the central government, nor recover from the farmers for instance (i) interest in excess of the principal amount, (ii)unapplied interest, (iii) penal interest,(iv) legal charges, (v) inspection charges and (vi) miscellaneous charges, etc. All such interest/charges were borne by the lending institutions. As on 31st August 2011, the Government of India (Gol) had released an amount of Rs.51.340.47 crore to the lending institutions as reimbursement under the Scheme. As a result of various steps taken by the government, the flow of
institutional credit to agricultural sector has recorded a tremendous growth especially after 2000-01. Short-term institutional credit met about two-thirds of total cost of inputs (excluding labour) used in agriculture during 2005-06. During the same year, the level of production credit exceeded 15 percent of the value of agricultural output while term-credit reached a level of 11 percent of the output. On 18th June, 2004, Gol announced a comprehensive farm credit package which, inter-alia, envisaged doubling of farm credit flow in three years with 2003-04 as the base year. The flow of agricultural credit since 2004-05 has consistently exceeded the target (Figure 1.2). Against a credit flow target of Rs.3, 25, 000 crore during 2009-10, the achievement was Rs.3, 84, 514 crore that worked out 118 percent of the target. The target for 2010-11 was Rs.3,75,000 crore while the achievement on March, 2011 was Rs.4,46,779 crore. The agriculture credit flow target for 2011-12 has been set at Rs.4,75,000 crore and the achievement as on 30th September 2011 is Rs. 2,23,380 crore.

![Figure 1.2](image)

**Figure 1.2**

Target and Achievement of Agricultural Credit from 2004-05 to 2011-12

Source: Department of Agriculture and Cooperation (2012).

Since Kharif 2006-07, the farmers have been receiving crop loans up to a principal amount of Rs. 3 lakh at 7 percent rate of interest. During 2010-11, the Government provided an additional 2 percent interest subvention as incentive to those farmers who repaid short-term crop loans as per schedule. The government has raised this subvention for timely repayment of crop loans from 2 percent to 3 percent from the year 2011-12. Thus the effective rate of interest for such farmers was 4 percent in the year 2011-12.
Agricultural production and income from farming is highly risky on account of natural calamities like droughts, floods, cyclones, uncertain rainfall, temperature variations, attack of pests and diseases, fire, sale of spurious seeds, fertilizers and pesticides, and market failures. With the growing commercialization of agriculture, the magnitude of risks and loss is increasing. Agricultural insurance is a step to protect farmers by minimizing the impact of such losses. But agricultural insurance has not so far made much headway in India.

Agricultural insurance is primarily covered under the National Agricultural Insurance Scheme (NAIS) implemented by the Agricultural Insurance Company (AIC) of India Ltd. This scheme is available to both loanees and non-loanees. During 2010-11, the Crop Insurance Schemes covered about 25 percent farmers as well as cropped area in the country. Further, there is a heavy regional and crop bias in its coverage. Since the beginning of the scheme in 1999, till the rabi season of 2010-11, 176 million farmers were extended insurance cover. Out of these, 15.90 percent were in Maharashtra, 14.20 percent in Andhra Pradesh, 12.5 percent in Madhya Pradesh, 10.60 percent in Uttar Pradesh, 8.55 percent in Rajasthan, 6.5 percent in Orissa, 6.30 percent in Gujarat and 6.25 percent in Karnataka. These eight States accounted for 76 percent of the total insurance claims, and 80 percent of insured area under the NAIS. The private sector has come out with financially viable insurance products in agriculture based on weather parameters such as the weather index. One such product is the rainfall insurance which has been developed by the ICICI- Lombard General Insurance Company and by the IFFCO- Tokyo General Insurance Company.

Efforts have been made to bring more farmers under the fold of Crop Insurance by introducing a Weather-based Crop Insurance Scheme (WBCIS) from the Kharif, 2007 season in selected areas on a pilot basis. WBCIS is intended to provide insurance protection to the farmers against adverse weather incidence, such as deficit and excess rainfall, high or low temperature, wide variation in humidity, etc. which are deemed to impact adversely the crop production. It has the advantage of settling the claims within the shortest possible time. Apart from Agricultural Insurance Company (AIC) of India Ltd. the private insurance companies with experience in rural insurance and possessing good infrastructure have been allowed
to undertake Pilot WBCIS. Since the Kharif 2007 season, 13 million farmers have been covered under the Scheme.

A Joint Group was constituted to study the improvements required in the existing crop insurance schemes and to develop broad parameters of an appropriate and farmer-friendly crop insurance scheme. The Group made an ‘in-depth’ study of crop insurance and risk mitigation programmes and submitted its report in December, 2004. Based on the recommendations of the Joint Group and views and comments of various stake-holders, a Modified National Agricultural Insurance Scheme (MNAIS) was approved by the government of India for implementation on a pilot basis in 50 districts during the remaining two years of the 11th five year plan from the Rabi 2010-11, season. It has improved features over NAIS as for example: actuarial premium with subsidy in premium ranging from 40 percent to 75 percent is offered to all farmers; only upfront premium subsidy is being shared by the central and state governments on a 50 : 50 basis; all claims liability is to be on the insurance companies; unit area of insurance is reduced to village and village panchayat level for major crops; indemnity for prevented sowing and planting risk & for post harvest losses due to cyclone; on account payment up to 25 percent advance of likely claims as immediate relief; more proficient basis for calculation of threshold yield; minimum indemnity level of 70 percent instead of 60 percent; underwriting by private insurance companies along with AIC.

Irrigation, Seeds, Fertilizers and Credit

There is no doubt that the overall size, quality, and efficiency of investment are always the key drivers of growth in any sector. In case of public investments in agriculture, as defined in the National Accounts Statistics, more than 80 percent is accounted for major and medium irrigation schemes. Even in the case of private investments in agriculture, almost half is accounted for by irrigation (minor, primarily through groundwater, but also now increasingly drip, etc.). So irrigation remains the most dominant component in the overall investment in agriculture. Without proper use of water, it is difficult to get good returns on better high yielding seeds variety and higher doses of fertilizers. Water will remain a critical input for agriculture in the decades to come until science develops seeds that can thrive in dry climate with very little water. The net sown area has remained around 141 million
hectare during the last 40 years. The cropping intensity, i.e., the ratio of gross cropped area to net cropped area, has however, gone up from 118 per cent in 1970-71 to 138 percent in 2008-09.

Figure 1.3
Movements in the Gross Cropped Area, Net Sown Area, Net Irrigated Area And Gross Irrigated Area, 1950-51 to 2008-09

Source: Department of Agriculture and Cooperation (2012).

India currently has an overall irrigation potential of 140 million hectares, out of which only about 109 million ha have been created, and around 80 million ha utilized. The current efficiency levels of public surface irrigation schemes (major and medium irrigation schemes) can be substantially improved through appropriate institutional reforms, better management and conducive environment. It may involve engaging water user associations, or some other groups and agencies, and even by unbundling the large surface schemes into storage (dams), transmission (main canals) and retail distribution of water (distribution at the farmer level). Groundwater irrigation, which is a bigger source of irrigation today, suffers from over-exploitation in most of the states, particularly in the north-west where the water table is depleting drastically. Free or low pricing of power for irrigation has primarily contributed to this problem. Major reforms in the power sector, improvement in the quality of power and availability of power are precondition for improving the overall groundwater situation in the country.
Despite increase in supply of institutional credit, its share in total credit for cultivator households was only 61 percent in 2002. This shows that the cultivator households are not able to come out of the clutches of money lenders and other non-institutional sources. It is also reported that only 27 percent of the total number of cultivator households received credit from formal sources while 22 percent were dependent on informal sources. The remaining households, comprising mainly small and marginal farmers, had no credit outstanding.

This calls for initiating measures to check the financial exclusion of large segment of small and marginal farmers from the institutional financial system. Another issue with institutional finance is that the flow of agricultural credit is skewed across states and regions. Even within states, there are sharp differences in credit flow to developed regions, regions with greater access to physical infrastructure and regions closer to urban centres as compared to underdeveloped districts or regions. Despite various agricultural insurance schemes launched from time to time in the country, these have served in a limited way. The coverage in terms of area, number of farmers and value of agricultural output is very small and most of the schemes are yet to prove their viability.
The Way Forward

Comprehensive new measures are needed in terms of innovative products and services to increase access to institutional credit. Complex documentation processes and high transaction cost in taking loans require attention. It is highly desirable to provide KCC to all farmers in the country and to raise credit limit, from time to time as needed.

Agricultural Production:

Increasing agricultural production for achieving food security for all has been the central focus of India’s agricultural development strategy since independence. Food security will always remain a very sensitive issue in India as the country has the largest concentration of the poor in the world. Food security implies food as well as nutrition security. A food and nutritional security scenario may be analyzed under four perspectives namely, food availability, economic access, absorption and stability in food systems.

As per the fourth advance estimates 2009-10, food grains production is estimated at 218.20 million tonnes comprising 103.84 million tonnes of kharif food grains and 114.36 million tonnes of rabi food grains. Further, production of all cereals was placed at 203.61 million tonnes as against 219.90 million tonnes in 2008-09 (final estimates). The production of wheat and rice in 2009-10 is estimated at 80.71 million tonnes and 89.13 million tones, respectively. However, production of oilseeds decreased from 27.72 million tonnes in 2008-09 to 24.93 million tonnes in 2009-10. This was due to decrease in production of groundnut and castor seed.

Table 1.4

All India Area, Production and Yield of Major Crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (Lak Hectare)</th>
<th>Production (Million tonnes)</th>
<th>Yield (Kg/Hectare)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Grains</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1240.68</td>
<td>1228.32</td>
<td>1213.66</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>266.93</td>
<td>275.58</td>
<td>261.08</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>50.55</td>
<td>44.15</td>
<td>42.02</td>
</tr>
<tr>
<td>Cotton</td>
<td>94.14</td>
<td>94.07</td>
<td>103.1</td>
</tr>
</tbody>
</table>

*4th Advance Estimates @: Production in million bales of 170 kg each
Source – DAC
The History of Agriculture Insurance in India before Independence

In India, the history of crop insurance can be traced back to 1920 when Mr. Chakravarti came up with a book entitled Agricultural insurance: A practical scheme suited to Indian conditions was published, which was a pioneering work on agriculture insurance. He proposed a rain insurance scheme for the then Mysore State to protect farmers against vagaries of the monsoons. The data on which the scheme was based on is in respect of Mysore state with an all India perspective. He (Chakravarti) formulated a scheme for drought insurance. The contract has three critical elements; specified date specified degree of deficiency in rainfall and prescribed amount of compensation. Chakravarti's scheme is parallel to the scheme suggested by World Bank (1992). It has a more concrete shape based actual empirical data. There are, however, two differences. The World Bank scheme covers all rural households and sells insurance in the form of lotteries, whereas Chakravarti’s scheme covered only farmers. Secondly, in the World Bank scheme, a person can, unlike in Chakravarti's scheme, freely choose one or more weather stations. Thus the idea of rainfall insurance is not new. The pioneering work of Chakravarti was probably lost in history. Perhaps his scheme will be a guideline for further improvement in crop insurance schemes.

Apart from the scheme mentioned above, Seth (1967) mentioned about existence of a crop insurance scheme which was implemented in 1943 in the then Dewas Junior State, which was compulsory in nature and provided modest benefits to the farmers, but not much details about the scheme were available.

Crop Insurance Scheme after Independence

Work on crop insurance received attention after India's Independence in 1947. The subject of crop insurance was discussed in the Parliament (Central Legislature) in 1947 and the then Minister of Food and Agriculture, gave an assurance that the feasibility of introducing crop and livestock insurance would be considered by the

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government. In 1948, G.S. Priolkar was appointed by the Ministry of Agriculture to study the problems of crop and cattle insurance under Indian conditions. The reports submitted by him were considered at a conference of economists, actuaries, insurance and agriculture experts held in Mumbai in 1949 and recommended that a pilot scheme of crop insurance should be immediately taken up, more or less, on the lines mentioned in Priolkar’s report. The operation of the scheme should be accompanied by well organized publicity and propaganda. The scheme was also placed before the Food and Agricultural Organization (FAO) working party on crop and livestock insurance at its meeting held in Bangkok in 1956. The working party endorsed the principles of the Indian programme and recommended its implementation on a pilot scale.

Two pilot schemes on crop insurance were circulated to the states for adoption. However, none of the states agreed to implement the schemes, mainly due to financial constraint. The interest in the subject again surfaced during the Third Five Year Plan (1961-66). However, the working group on agriculture was reluctant to include crop insurance in the plan. But the government of Punjab proposed the inclusion of crop insurance in its state plan and sought financial assistance from the central government for this purpose. The services of T. Yamauchi, an insurance expert in Japan and G.S Priolkar was obtained for formulating the scheme. These experts formulated the scheme for introduction on a compulsory basis in a few selected areas and recommended the preliminary steps to be taken for introducing the scheme. But the Punjab state government was not able to introduce crop insurance as the powers to pass the legislation related to insurance were vested with the central government.

Following these developments and increasing demand for crop insurance, the Government of India decided in 1995 to have a crop insurance bill and model scheme of crop insurance was formulated so that the interested States could introduce crop insurance in the area under their jurisdiction. A draft bill and model scheme were prepared and circulated to the states to obtain their views and comments on the subject but again none of the states introduced the scheme citing the same reason of paucity of funds and the state of Punjab was no longer interested.
in implementing the scheme as it argued that the state has sufficiently developed irrigation potentials.\(^{15}\)

Further, incorporating the comments and views of the states, the GOI in March 1970 considered the draft bill and the model scheme in March 1970. The draft bill and the model scheme were then referred to the expert committee (under the chairmanship of Dharm Narain) in July 1970, for fuller examination of the economic, administrative, financial and actuarial implications. The committee reported that in the conditions prevailing in the country, it was not advisable to introduce crop insurance in the near future on a pilot or on experimental basis. Commenting on the recommendations of the Expert Committee, Dandekar wrote, "crop insurance in the country has been given an expert burial. Moreover, this has been so expertly done that no room is left for an introduction of crop insurance in the near future even on a pilot or an experimental basis".\(^{16}\)

Despite the unfavorable report of the expert committee, various constraints and financial obligation, and political compulsions forced the government to introduce crop insurance in the country in 1972 on an experimental basis (Sinha, 2004; Bhende, 2005; Mishra, 2005; Vyas Singh, 2006; Raju & Chand, 2008 and Singh 2010).

First ever-individual Approach Scheme

In 1972-73, the general insurance department of LIC introduced a crop insurance scheme on experimental bases on H-4 cotton. It was based on individual approach. Later in 1972, general insurance business in the country was nationalized by an Act of Parliament, and the GIC was set up and the new entity took over as the implementing authority of crop insurance. Subsequently, the scheme included groundnut, wheat, potato and gram crops and was implemented in the states of Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka and West Bengal. The scheme continued till 1978-79. However, it covered only 3110 farmers for a premium of Rs.4.54 lakhs against claims of Rs.37.88 lakh. The GIC considered it non-viable to continue with the scheme and terminated it.

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\(^{15}\) Bhende, M. J., "Agricultural Insurance in India Problems and Prospects", op. cit.

Pilot Crop Insurance Scheme (PCIS)

In the background and experience of the aforesaid experimental scheme for crop insurance, a study was commissioned by GIC and entrusted an eminent agricultural economist, V.M. Dandekar to suggest appropriate crop insurance scheme. Based on the recommendations, PCIS was introduced by GIC in 1979. The important features of the scheme were:

1. The scheme was based on "Area Approach". The scheme covered cereals, millets, oilseeds, cotton, potato and gram.

2. The scheme was available to loanee (those who availed crop loans from government banks) farmers only and on voluntary basis.

3. The risk was shared between GIC and State Governments in the ratio of 2:1.

4. The maximum sum insured was 100 per cent of the crop loan, which was later increased to 150 per cent. A 50 per cent subsidy was provided for insurance charges payable by small and marginal farmers; the State Government and the Government of India shared subsidy on 50:50 basis.

5. The PCIS was launched in 1979-80 and continued till 1984-85. It was implemented in 12 states during the operation of the scheme in six years. It covered only 6.22 lakh farmers. On an average, one lakh farmers were covered in a year; for total premium of Rs.195 lakh against claims of Rs.155.68 lakh and the total ‘claim-premium’ ratio was 79.8 per cent.

6. Only a few major cereals, pulses and oil seed crops were covered under the scheme with a provision for inclusion of non-food crops with adequate crop cutting data.

7. The scheme was voluntary in nature. The GIC of India formulated separate schemes for kharif and Rabi seasons and implemented in select areas in consultation with the state governments.

8. The crop insurance scheme was multi-peril insurance in nature as it covered almost all the natural risks except war and nuclear risks.
9. The premiums were to be set in such a way that the premium collected for the area over the long-run matched the indemnity payments over the same time horizon (i.e., it is actuarially fair).

10. The threshold yield for various crops ranged between 50 to 80 per cent of the normal yield of the area during the specific season. The yield above the threshold was not indemnifiable or, in other words, the farmers had to bear the loss between normal and threshold yield.

**Comprehensive Crop Insurance Scheme (CCIS)**

On the basis of experience gained from implementing PCIS, CCIS was introduced from April 1985 by the Government of India with the participation of State Governments. The Scheme was linked to short term crop credit and implemented on homogeneous area basis. The main features of the scheme were:

1. It covered loanee-farmers. The coverage was restricted to 100 per cent of crop loan subject to a maximum of ten thousand per farmer.

2. The premium rates were two per cent for cereals and millets and one per cent for pulses and oil seeds. Small and marginal farmers were given a subsidy of 50 per cent of the premium payable, shared equally by the central and state governments.

3. The central and state governments shared the premium and claims in the ratio of 2:1.

4. The scheme was optional to state governments.

The scheme was a multi-agency effort, involving GOI, NABARD, State Governments, Banking Institutions and GIC. The scheme, in its 14 years of operation, covered 7.63 crore farmers, for a premium of Rs. 403.56 crore and paid claims amounting to Rs. 2,319 crore.

**Experimental Crop Insurance Scheme (ECIS)**

Attempts were made from time to time to modify the CCIS as demanded by the states. During 1997, a scheme viz. ECIS was introduced from Rabi 1997-98 which was implemented in 14 districts of five states. The scheme was similar to CCIS except that it was meant for all small and marginal farmers with 100 per cent
subsidy in premium. The central and state governments shared the premium, subsidy and claims in 4:1 ratios. The scheme was discontinued after one season due to administrative and financial difficulties. The scheme covered 4.5 lakh farmers. The sum insured was Rs.168.1 crores and claims paid were Rs.37.8 crore against premium of Rs.2.8 crores.

Pilot Project on Farm Income Insurance Scheme (FIIS)

Under this scheme, insurance was provided against loss in actual farm income against the guaranteed income in a notified area arising out of adverse fluctuations in yield due to one or more non-preventable perils and adverse fluctuations of market prices as measured against minimum support price (MSP) for the crops covered. The project covered paddy and wheat crops and all farmers (loanees on compulsory and others on voluntary basis) in selected states and districts which gave their consent for inclusion. The sum insured was guaranteed income per unit area arrived at using average yield of past 7 years, current MSP and indemnity level. 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 percent and a minimum of 80 per cent of the MSP. The premium rates were actuarial for states and crops (irrigated and un-irrigated separately) at 75 per cent subsidy for small and marginal farmers and 50 per cent subsidy for others. Area approach was followed. In all, 18 districts from ten states for wheat and three districts from three states for paddy, were selected in 2003-04.

National Agricultural Insurance Scheme (NAIS)

NAIS was introduced in the country from 1999-2000 Rabi season as a successor to CCIS and is currently in operation. Agricultural Insurance Company of India (AIC) was formed in December, 2002 and it became the implementing authority and took over implementing authority from LIC and started operating from April, 2003. This scheme is available to both loanees and non-loanees. It covers all food-grains, oilseeds and annual horticultural / commercial crops for which past yield data are available for an adequate number of years. The scheme is operating on the basis of

both 'area approach', for widespread calamities, and 'individual approach', for localized calamities such as hailstorm, landslide, cyclone and floods.

Weather-Based Crop Insurance Scheme (Pilot scheme)

Weather-Based Crop Insurance Scheme (WBCIS) is implemented by AIC. It is a unique weather-based insurance product designed to provide insurance protection against losses in crop yield resulting from adverse weather incidences. It provides payout against adverse rainfall incidence (both deficit and excess) during Kharif and adverse incidence in weather parameters like frost, heat, relative humidity, unseasonal rains, etc. during Rabi season. As such, it is not yield guarantee insurance. WBCIS has been piloted in the country since Kharif 2003 season. Some of the states where the scheme is piloted over the years are Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh etc. Weather-based crop insurance scheme has some advantages over the conventional crop insurance products. They are as follows:

1. Trigger events like adverse weather can be independently verified and measured.
2. It allows speedy settlement of claims.
3. All farmers can buy insurance product.
4. Government provides subsidy on premium and hence premium payable is affordable.
5. It provides transparent and direct payouts for adverse weather incidences.
6. Insured is not required to submit claim form or other documents as proof of loss.

Varsha Bima (Rainfall insurance Pilot scheme)

Rainfall insurance covers anticipated shortfall in crop yield on account of deficit rainfall. Rainfall insurance is voluntary for all classes of cultivators who stand to lose financially upon adverse incidence of rainfall. It is meant for cultivators for whom NAIS is voluntary. The insurance operates during June to September for short duration crops; June to October for medium duration crops; and June to November for longer duration crops. Further, these periods are state-specific. In case of sowing failure, option is from 15th June to 15th August. A cultivator can buy rainfall insurance only up to 15th June for sowing failure option and 30th June for other
options. Proposal forms are available at the loan disbursing outlets viz PACS and branches of all cooperative, commercial, regional rural banks.

**Rabi Weather Insurance (pilot scheme)**

Weather Insurance (Rabi) is a mechanism for providing effective risk management aid to those individuals and institutions likely to be impacted by adverse weather incidences. The most important benefits of Weather Index Insurance are:

a) Trigger events like adverse weather events can be independently verified and measured.

b) It allows for speedy settlement of indemnities, as early as a fortnight after the indemnity period.

c) The scheme is available to all farmers.

Insurance is available for major Rabi season crops; the scheme is available in Uttar Pradesh, Madhya Pradesh, Maharashtra and Rajasthan. Rabi crops are vulnerable to weather factors, such as excess rainfall, frost, and fluctuation in temperature, etc.

**Private Participation in Crop Insurance**

There are some ten private sector insurance companies in the general insurance business. Only two companies in the private sector have initiated crop insurance that took on small pilot bases. The Insurance Regulatory and Development Authority (IRDA) is a government agency to regulate insurance business in India. It has stipulated that every new insurance company undertaking general insurance business, has to underwrite business in the rural sector (crop insurance is included in rural sector) to the extent of at least two per cent of the gross premium during the first financial year. Those companies which do not meet these targets penalties are imposed and many companies are getting away by paying penalties of nominal amounts.19

ICICI Lombard, a private insurance company, piloted rainfall insurance scheme in 2003 for groundnut and castor in Mahabubnagar district of Andhra Pradesh. The insurance policy was developed with the technical assistance from the World Bank and was designed as insurance against deficit rainfall. Two insurance policies were

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designed for the two crops in kharif season. The policy triggers, phases and payouts try to maximize the correlation between economic loss and rainfall events. The triggers are set in mm of accumulated rainfall as measured in local weather stations. If it rains less than 1st trigger level within a given period there is a payout per mm of deficient accumulated rain per acre insured. If the accumulated rainfall is below the second trigger level then there is a maximum lump sum payout of the insurance. In order to maximize the correlation between rainfall and crop production, Kharif season is divided into three different phases, each with its own trigger and payout-sowing, flowering and harvest. In addition to deficit rainfall in some areas there is also a risk of excess rainfall towards the end of Kharif. The other private player in crop insurance market, IFFCO-Tokyo General Insurance, which has also piloted rainfall insurance under the name 'Baarish Bima' during 2004-05 on limited scale in Andhra Pradesh, Karnataka and Gujarat.²⁰

The penetration of private players in crop insurance market in India is very meager and on limited scale, compared with the government insurance, given the subsidies and access to the administrative machinery for delivering insurance. To encourage private companies to enter crop insurance market in significant measure, proper incentives should be provided by the government. An alternative to public-private separate entity in crop insurance is public-private partnership (PPS) in providing crop insurance as available in countries like the US and Spain; the basic feature of the system is that all insurable agricultural risks are covered by the private sector and all types of policies are subsidized by the state.

**Statement of the Problem**

The father of the nation, Mahatma Gandhi, once said: “agriculture is the backbone of Indian Economy”.²¹ Although more than half of the country’s population is engaged in agriculture today, the contribution of agriculture to the GDP of the nation is merely 14 per cent. Therefore, the efficiency of Indian agriculture needs to be increased through enhanced growth in agriculture and allied sectors. Sharp rise in the production of food-grains during India’s Green Revolution in the late 1960s and

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also in 1970s enabled the country to become self-sufficient in food-grains. Later, with the intensification of agriculture during 1980s and 1990s, the country saw further increase in the production of almost all agricultural commodities. But by the end of the 20th century and the beginning of the 21st century, the slowdown in agricultural growth has become a major national concern.\footnote{Ibid., p.1.}

In most poor countries, agriculture is a major employer and source of national income and export earnings. Growth in agriculture tends to be pro-poor – it harnesses poor people’s key assets of land and labour, and creates a vibrant economy in rural areas where the majority of poor people live. Agriculture connects economic growth and the rural poor, increasing their productivity and incomes. The importance of agriculture for poverty reduction, however, goes well beyond its direct impact on rural incomes. Agricultural growth, particularly through increased agricultural sector productivity, also reduces poverty by lowering and stabilizing food prices; improving employment for poor rural people; increasing demand for consumer goods and services, and stimulating growth in the non-farm economy. A positive process of economic transformation and diversification of both livelihoods and national economies is the key to sustained poverty reduction. But it is agricultural growth that enables poor countries, poor regions and ultimately poor households to take the first steps in this process.\footnote{Organization for Economic Co-operation and Development, “Promoting Pro-Poor Growth: Policy Guidance for Donors”, OECD, 2006} Today, rural households face challenges much different than those faced by the “Green Revolution” producers who achieved sustained gains in agriculture productivity only a few decades ago. Over the last 20 years, there has been a substantial decline in public sector support for agriculture and many producers have lost access to key inputs and services. While public sector provision of these services was not very efficient, it often provided the sole linkage to markets for poor rural producers. Today, such links are tenuous and complicated by much greater integration of the global economy. Smallholder producers now compete in markets that are much more demanding in terms of quality and food safety, and more concentrated and integrated than in the past. OECD agricultural subsidies further distort many of these same markets. Economic integration is accompanied by other challenges that further weaken the
socio-economic position of the rural poor. In parts of the world, especially in sub-Saharan Africa, rural areas are hard hit by the HIV/AIDS pandemic, which is disrupting the transfer of knowledge, destroying traditional land allocation systems, and dramatically changing the demographic composition of many rural communities. Climate change with growing population density is increasing pressure on an already fragile natural resource base that is the mainstay of rural livelihoods. Conflict conditions, many of which result from, or are provoked by, poverty, are further eroding the livelihood systems and resilience of rural poor women and men. Attention to agriculture in terms of policy commitments and investment levels has declined in both international donor and developing country policies and programmes, despite the demonstrated high rates of return and the reductions in poverty that come from such investments. Yet achieving the internationally agreed poverty reduction targets will depend on establishing higher rates of economic growth, which equate to growth in agricultural sector productivity for the majority of countries where these targets are relevant. And a more robust agriculture sector will need to be framed within a new agenda that not only matches today’s rural and global realities but engages and enables poor households to generate sustainable livelihoods.  

Globally, 1.2 billion people are extremely poor (surviving on less than USD 1 a day), and three quarters live in rural areas. Poverty is predominantly a rural phenomenon. Extremely poor people spend more than half of their income to obtain (or produce) staple foods, which account for more than two thirds of their caloric intake. Most of these people suffer from nutritional deficiencies, and many go hungry at certain times of the year. In recent years, development agencies and national governments have renewed their commitment to reducing poverty, hunger and other human deprivations, as evidenced by the Millennium Development Goals (MDGs). Among other objectives, the goals aim to halve the proportion of people living on less than USD 1 a day by 2015 (from the starting level of 1990). That means cutting the share of extremely poor people in low and middle income
countries from 28% to 14%. The goals also call for halving the proportion of people suffering from hunger by 2015. Rural poverty and hunger fell sharply between 1975 and 1990, but the rate of poverty reduction has since slowed. Net aid (that is, official development assistance) to developing countries fell from 0.35% of the gross national income in the countries of the Organization for Economic Cooperation and Development (OECD) in 1982-83 to 0.24% in 2002-03.\textsuperscript{26} The real value of net aid disbursed to agriculture in the late 1990s was only 35% of the level in the late 1980s, according to IFAD, and although the proportion of the economically active population engaged in agriculture has been falling in developing regions, it still exceeds 50% in Africa and Asia. Agricultural finance has been one of the most prominent elements of the rural development strategies used by development agencies and national governments. Over the past 40 years, billions of dollars have been provided to support agricultural production and the Green Revolution.\textsuperscript{27} But this financing has long been characterized by poor loan repayment rates and unsustainable subsidies.\textsuperscript{28} Accordingly, agricultural credit from some donors and multilateral development banks has dropped dramatically in recent decades and is now often considered too risky. For example, agriculture accounted for 31% of World Bank lending in 1979-81, but by 2000-01 it had fallen to less than 10%. This drop was partly due to disappointment with large agricultural finance projects and partly to the fact that World Bank rural finance increasingly occurred in other areas: through microfinance projects or as part of community development, infrastructure, or rural development projects. Lending by other multilateral development banks and bilateral aid agencies has mirrored this trend. Farming is central to the livelihood of the rural poor. It is generally influenced by climate change. Accompanying changes are likely to be both global, as with rising sea levels attributable to ice-melt, and local, such as changes in rainfall patterns. Responses to climate change can either seek to reduce the level or rate of change

Natural disasters hit hard. They may cause heavy losses to farmers and forest owners. Insurance can assist in managing these losses, and disaster insurance is that branch of this financial mechanism that is especially geared to covering losses from adverse weather and similar events beyond the control of growers.

The incidence of risk and risk-averse behaviour in farming is important to policymakers for three reasons. First, fluctuations in farm incomes, and particularly the risk of catastrophic losses, may present welfare problems for rural people. Second, because farmers are typically risk-averse and seek to avoid risks through management practices, the average returns to their resources are reduced. Third, farmers exposed to severe risks are more likely to default on bank loans, particularly in years of natural catastrophes. These factors warrant governments to intervene by providing formal risk-sharing mechanisms. Risk-sharing arrangements aim to reduce the burden of risk for the individual farmer. This can be brought about in two ways (a) by transferring the risk to other individuals or institutions, which are better able to bear the risk or which are less risk-averse, (b) by pooling risks across regions, crops, or other sectors of the economy, to take advantage of less than perfectly covariate risks. Efficient risk pooling reduces the total risk burden to society and may benefit farmers even if they have to pay the full cost of the risk-spreading mechanism. Micro or crop insurance, customized to specific needs of the poor, may be an effective instrument for the purpose. This study looks at the genesis of agricultural insurance in India with special reference to Jammu and Kashmir, examines various agricultural insurance schemes launched from time to time and the coverage provided by them. Major issues and problems faced in implementing agricultural insurance will be studied.

Marx was highly impressed by the efficiency of large-scale farming in England and regarded the elimination of peasant farming as an essential step in agricultural development. His theory had strong impact on the structural developments in many former socialist countries, especially in the countries of the former Soviet Union. Large-scale cooperatives and state farms were created which were oriented towards output maximization. Increasing agricultural output by means of expansion of areas cultivated or grazed has played a dominant role throughout history. The most
dramatic example in the Western history was the opening up of new continents as sources of food and agricultural raw materials for the Metropolitan areas in Western Europe. In the Eastern hemisphere, the largest project of crop area expansion was the Virgin Lands Campaign which took place between 1954 and 1964 and cultivated about 30 million hectares of the steppes in Western Siberia and Kazakhstan. This policy which was designed under Khruschev's directions extended grain production to marginal areas with extremely low and fluctuating precipitation. Since then, crop production has played an important role in the gross domestic product of Kazakhstan and serves as the most important base of living for about 43 per cent of the population that lives in rural areas. However, agricultural business is risky and incomes from crop production are particularly prone to strong income fluctuations. Income stabilization in the agricultural sector plays an important role for overall economic sustainability and might justify income stabilizing governmental policies. Stabilization of agricultural incomes might significantly reduce incentives for rural-urban and international migration and human capital degradation. The justification for agricultural income stabilization finds a good repetition in the multifunctional character of agricultural production. This means that agriculture produces both primary and secondary products. Primary products are food and fibre. Secondary products can be summarized as shaping the landscape, providing environmental benefits, such as land conservation, the sustainable management of natural resources, the preservation of biodiversity and last but not the least, a contribution to socio-economic development. Finally, agricultural income stabilization might contribute to the narrowing of the rural-urban income gap and the fight against rural poverty, which are predominant problems in many transition countries.29

Worldwide, Agriculture crop insurance is seen as an important instrument of farmers' income stabilization. For politicians, the introduction and promotion of Agriculture crop insurance promises voters' support and success in elections, an indicator of the political topicality in post-soviet countries, are frequent headlines in recent press releases. However, there might be more efficient income support mechanisms in place that would fulfill the same objective and extend better support to smaller farmers. This contribution focuses on risk analysis on the farm-level and

discusses the welfare implications of risk management instruments as a side aspect. From a normative point of view, policy objectives should be based on societal needs. The need for income stabilization in Indian agriculture is particularly reflected by the extreme crop output fluctuations caused by adverse weather conditions. The analysis of affordable and efficient risk management instruments in a transition country seems scientifically and practically rewarding. From a scientific point of view, unique data has to be collected and analyzed to reflect the situation of decision-makers appropriately. Methods will have to be developed to account for structural breaks and uncertainty caused by transition. From a practical point of view, innovative risk management instruments can be tested on a pilot-basis and results and recommendations disseminated to political decision-makers, farmer organizations and insurance companies.

Problems associated with risks in agriculture are some of the reasons why many governments intervene directly in agricultural product and factor markets. Risk-related interventions include guaranteed prices, subsidized credit, and publicly provided crop insurance. Such interventions can be expensive, both in their cost to the national exchequer and in their effects on aggregate resource allocation. Even then, they may not be effective in achieving their goals.30

Agriculture production and farm incomes in India are frequently affected by natural disasters such as droughts, floods, cyclones, storms, landslides and earthquakes. Susceptibility of agriculture to these disasters is compounded by the outbreak of epidemics and man-made disasters such as fire, sale of spurious seeds, fertilizers and pesticides, price crashes etc. All these events severely affect farmers through loss in production and farm income, and they are beyond the control of the farmers. With the growing commercialization of agriculture, the magnitude of loss due to unfavorable eventualities is increasing. The question is how to protect farmers by minimizing such losses. For a section of farming community, the minimum support prices (MSP) for certain crops provide a measure of income stability. But most of the crops and in most of the states MSP is not implemented. In recent times, mechanisms like contract farming and futures trading have been established which are expected to provide some insurance against price fluctuations directly or

indirectly. But, agricultural insurance is considered an important mechanism to effectively address the risk to output and income resulting from various natural and manmade events.

Agricultural Insurance is a means of protecting the farmers against financial losses due to uncertainties that may cause agricultural losses arising from the named or all unforeseen perils beyond their control. Unfortunately, agricultural insurance in India has not made much headway even though the need to protect Indian farmers from agriculture variability has been a continuing concern of agriculture policy. According to the National Agriculture Policy 2000, “Despite technological and economic advancements, the condition of farmers continues to be unstable due to natural calamities and price fluctuations”. In some extreme cases, these unfavorable events become one of the factors leading to farmers’ suicides which are now assuming serious proportions. Agricultural insurance is one method by which farmers can stabilize farm income and investment and guard against disastrous effect of losses due to natural hazards or low market prices. Crop insurance not only stabilizes the farm income but also helps the farmers to initiate production activity after a bad agricultural year. However, one needs to keep in mind that crop insurance should be part of overall risk management strategy. Insurance comes towards the end of risk management process. Insurance is redistribution of cost of losses of a few among many, and cannot prevent economic loss. There are two major categories of agricultural insurance: single-peril and multi-peril coverage. Single peril coverage offers protection from single hazard while multiple perils provide protection from several hazards. In India, multi-peril crop insurance programme is being implemented, considering the overwhelming impact of nature on agricultural output and its disastrous consequences on the society, in general, and farmers, in particular. Insurance can assist in managing these losses, and disaster insurance is that branch which is geared to covering losses from adverse weather and similar events beyond the control of growers. Agricultural insurance is one method by which farmers can stabilize farm income and investment and guard against disastrous effect of losses due to natural hazards or low market prices. It helps the farmers to initiate production activity after a bad agricultural year. It cushions the

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shock of crop losses by providing farmers with a minimum amount of protection. It spreads the crop losses over space and time and helps farmers make more investments in agriculture. It forms an important component of safety-net programmes. Insurance comes towards the end of risk management process. Insurance is redistribution of cost of losses of few among many, and cannot prevent economic loss. Agricultural crop Insurance is a means of protecting the agriculturist against financial losses due to uncertainties that may cause agricultural losses arising from the named or all unforeseen perils beyond their control. General Insurance Corporation (GIC) of India has formed a specialist subsidiary, Agricultural Insurance Corporation (AIC) in order to provide individual/institutional focus for this class of business. In 2009-10, the programme insured 23.92 million farmers, with a total sum insured Rs. 1266.51 crore on ha. 33.75 million Crop land.

Figure 1.5
Agriculture Insurance Cycle

OBJECTIVES

Overall objective of the study was to understand the performance of National Agricultural Insurance Scheme (NAIS) and process of its implementation in India in general and Jammu & Kashmir in particular. The main objectives of the present study were as follows:

1. To understand the problems and perceptions of agriculture insurance beneficiaries in implementation of NAIS in India in general and Jammu & Kashmir state in particular.

2. To understand whether agriculture insurance is feasible or not.

3. To know to what extent the agricultural insurance can ameliorate the problems of agriculturists.

4. To what extent the agricultural insurance can cover the risks in farming.

5. To examine the functioning of agricultural insurance in Jammu and Kashmir whether the scheme is viable.

6. To find out the effect of agricultural insurance on debts of the farmers.

7. To analyze the perceptions of bankers and insurance agencies regarding implementation of the scheme,

8. To suggest interventions for improving the working of National Agriculture Insurance Scheme (NAIS).

**HYPOTHESES OF THE STUDY**

Precise hypotheses of this study based on the objectives stated above, as per deductive logic, are the following:

1. Agricultural Insurance covers the risks in farming.

2. Agricultural Insurance can stop suicide by the stressed farmers.

3. Agricultural Insurance can save the farmers from the gamble in the monsoons.

4. Abrupt Climate Change has further aggravated the problems of farmers.

5. Agriculture is fast becoming uneconomic activity.

6. Large number of crops and farmers are left out of the schemes.

7. There are no incentives for the bankers and insurance companies to have strict monitoring mechanism to control moral hazard problems.

8. Performance of agricultural insurance schemes varied greatly across states and crops.
Motivation and focus of the study

Agriculture is central to the livelihood of the rural poor and in the attainment of the Millennium Development Goals (MDGs). Agriculture can be the engine of growth and is necessary for reducing poverty and food insecurity, particularly in Asia and sub-Saharan Africa. Understanding the dynamic processes of change are crucial to position the sector both for faster growth and sustained development, which is vital for food and livelihoods security for millions of farmers worldwide. The rapid changes occurring in the agriculture sector present opportunities and challenges for the sector’s central role in poverty reduction and food security. Markets and the demand for agricultural commodities are changing rapidly, especially for high-value products. These changes may create opportunities for greater market participation for both women and men; however, for women in particular, to date, equal access to these markets is still limited. Advances in agricultural knowledge and technology that accompany the changes in the sector are creating an array of new choices for producers, altering what is produced, where it is produced, and how it is produced.

Factors outside the sector, such as widespread environmental changes, are also altering agricultural potential throughout the world. In particular, climate change is now affecting water supply and weather conditions and consequently impacting agricultural production. The composition of rural households is changing considerably as a consequence of HIV and AIDS, with deaths of young adults; farm households are left in the hands of children and grandparents with subsequent impacts on agriculture. Migration, arising mainly from poverty or prompted by natural disasters or violent conflicts, now form a dynamic force, changing the landscape of the rural population. Remittances sent back home by migrants form substantial sources of funds supporting household consumption and productive investments in rural areas. Migration shows stark gendered differences. In some regions, men more than women are likely to abandon agricultural work at home and migrate first to seek income in other sectors. Women are being left to carry the full burden of agricultural production, but often with no legal protection or rights to property ownership. Although the changes in agriculture create new sources of opportunities for livelihood and food security, they also pose significant

uncertainties. Equity concerns are being raised. Poor and small producers, often women, may be excluded from the lucrative high-value markets because they may not be able to compete in terms of costs and prices with larger producers. Globalization and trade liberalization have opened more market opportunities internationally and have induced greater innovations and efficiencies in many cases. But, at the same time, globalization has led to painful transition periods for some economies and has favoured the producers who have more resources and information, education, and capacity to cope with increasingly stringent market demands. Thus, these changes may increase the vulnerability of individuals with few resources, especially poor women, who have traditionally had limited access to crucial services and opportunities because of persistent cultural, social, and political bias. Within the development community, a renewed interest has been expressed in support of agriculture. The World Development Report of 2008: Agriculture for Development has helped spearhead renewed thinking about the sector, calling for more and better investments in agriculture. Increased investment in the sector is also flowing from the private foundations (such as the Bill and Melinda Gates Foundation). In the light of such renewed interest and resources, this is an opportune time to rethink agriculture strategies for better development outcomes. Concerted efforts are required to use fully the strengths and diversity among the rural people and their institutions, to manage innovatively the risks and challenges associated with rapid changes in the sector, and to ensure that growth and benefits reach poor women and men. For instance, women play a major role in agriculture, but the role is often unrecognized. The design of many development policies and projects continue to assume wrongly that farmers and rural workers are mainly men. Failure to recognize the roles, differences, and inequalities poses a serious threat to the effectiveness of the agricultural development agenda.

Agriculture is an inherently risky business. It is subject to a number of inhabiting factory, viz. random price, climatic, biological, and geological shocks that require coping strategies and financial management instruments to deal with the implications. Traditional risk management strategies and ex-post government provided emergency relief has often not proven to be sufficiently effective and

robust in preventing serious economic loss or helping a speedy recovery. For the most part, producers in developing countries are quite exposed to weather vagaries and have little access to formal agricultural insurance products that would allow them to transfer production risk to other parties. Agricultural insurance was more widespread in Latin America and other developing regions of the world during the 1960s and 1970s. However, most of the comprehensive, multiple peril programs common then, encountered financial difficulties and were either scaled back or completely closed. At present, in Latin America, the volume of agricultural insurance premiums is a miniscule share of total insurance premiums. Nonetheless, agricultural insurance is reemerging as a topic of interest, especially in the light of the need to improve agricultural competitiveness in increasingly integrated global commodity markets. The challenge is how to overcome obstacles and deliver efficient and sustainable agricultural insurance products. The principal obstacles - lack of high quality information, inadequate regulatory frameworks, weak supervision, lack of actuarial expertise, lack of professional expertise in designing and monitoring agricultural insurance products, a mass of low-income, dispersed clients, who may not be willing or able to pay actuarially sound premiums for multiple peril products, and the tendency of governments to undermine market development through inappropriate use of subsidies and disaster relief funds - are highlighted and discussed. Case studies on Uruguay, the Dominican Republic, and Peru reveal how crop insurance products are evolving and/or what government-supported initiatives are under way to expand coverage. Recommendations of how to build markets step-by-step and the importance of applying new technology to lower costs are made. Agriculture is a risky business. Producers face a host of different risks, among them is production or yield risk. While production risk cannot be totally eliminated, it can be reduced and managed. In order to address the financial implications of this type of risk, producers have historically relied on a variety of strategies and coping mechanisms that can be categorized into three general classes: risk mitigation, risk transfer, and risk retention. This study also focuses on how to effectively transfer risk. Producers often report that production and price risks are their two major concerns. Each year, unmanaged production risk


37
contributes significantly to high economic losses throughout the developing world and helps to perpetuate poverty and income inequality. Among the numerous sources of production or yield variability, weather is universally recognized as the dominant one. Recent research from the Baltic States shows that weather differences alone explained 35% of the variation in yield for a representative sample of farmers. Of course, the relative importance of the factors may vary from place to place and with the level of technology employed. But what distinguishes climate risk from the other listed factors, however, is the degree of human control possible. The non-weather factors can be significantly reduced or mitigated with on-farm strategies, with the principal constraints being farmer-knowledge and financial resources. In contrast, weather cannot be controlled and constitutes a residual risk that should be transferred, and it cannot be retained with serious financial indications. For example, the farmer can select the best seeds for planting, match plant agronomic requirements with soil characteristics, take preventive actions to minimize the risks of insect infestations or disease, and fertilize according to a schedule based on best available extension service knowledge and nutrient analysis of the soil. In practice, however, the degree of effective control is far from ideal, more so in the case of developing countries where extension services are weak, farmers have less access to information, and have fewer years of education, and limited access to credit. Thus, the combination of management shortcomings and weather vagaries makes agriculture more risky than most other economic enterprises in developing countries. This high degree of riskiness, especially in a sector dominated by producers with low-incomes and scant assets, has serious implications for economic growth, social equity, and poverty alleviation. Market and government-based solutions are needed.

Three major types of natural phenomena contribute to yield risks in agriculture: hydro-meteorological, geological, and biological. Hydro-meteorological risks include excessive rain, floods, droughts, high winds, tornados, hurricanes, hail, frost, abrupt temperature changes, heat waves, blizzards, prolonged cold spells, avalanches, landsides, high waves, storm surges. Geological risks include earthquakes, volcanic eruptions, and tsunamis. Biological risks include diseases and insect infestations. Each of these risks can then be categorized as either catastrophic or non-catastrophic, depending on frequency, scale, intensity, and duration. Catastrophic risk refers to natural disasters (earthquakes, hurricanes, volcanic
eruptions, tsunamis, tidal waves, storm surges, etc.) that inflict large-scale damage over an extended area but are infrequent, low probability events. Non-catastrophic climatic risks (droughts, floods, landslides, mudslides, hail storms, freezes, heat waves, etc) affect localized areas (one or two provinces) or sometimes only a few farms. They tend to be more frequent, last longer, but cause less total economic damage. Biological risks such as insect infestations and disease epidemics tend to be localized but in some instances, if the disease is highly communicable, livestock may have to be slaughtered over a very wide swath surrounding the original outbreak point as a containment measure. Thus, an outbreak of brucellosis, a bacterial infection that affects ruminants, on one farm is a non-catastrophic risk whereas an outbreak of mad cow disease (BSP) would be a catastrophe for the entire cattle industry in a particular country.

Agricultural insurance is presented as important financial risk management tool but not as a panacea for unprofitable farms, management failures, underinvestment in public infrastructure, or compensation for other poorly functioning factor markets. Different types of agricultural insurance products-single peril, multiple perils, parametric, and revenue-each have a niche but should adhere to basic principles of actuarial fairness, seek to minimize problems with adverse selection, moral hazard, and administrative costs. Governments have a vital role to play in providing the necessary information needed to measure, evaluate, and monitor risk, in maintaining an auspicious but sound regulatory and supervisory framework, in helping with reinsurance and catastrophic disaster relief, and supporting private insurance providers with technical assistance and training. Often time, the argument is made that “public subsidies for premiums” are necessary in order to make premiums more affordable for the majority of farmers. The argument presented here is that scarce public monies may be better spent on creating favorable market conditions for the development of the industry (i.e. the maintenance of databases, training, and pilots) than on making transfers to private individuals. In the context of developing countries, with large rural populations (often exceeding 20%), sizeable agrarian sectors (agricultural share of GDP >10 %, agricultural exports as a share of total exports > 30%), and severe fiscal constraints, agricultural insurance systems should be cost effective and operate as part of a larger, layered risk management framework. Installing comprehensive and universal systems, as is the case for
several industrialized countries, may be an inefficient use of scarce public monies for developing countries. In a layered framework, farmers should be trained how to reduce and cope effectively with some of the production risks on-farm through better management practices and diversification strategies; how to transfer some of the production risks to financial markets through efficient and sustainable instruments (insurance, savings, and credit); and how to rely on the government assistance for catastrophic events. In the latter case, rules for accessing disaster relief should be clear ex-ante and not remove or undercut incentives for the adoption of better on-farm management techniques (moral hazard), the purchase of private agricultural insurance, or the accumulation of personal savings.

Figure 1.6

The holistic insurance approach

India’s crop insurance program is the world’s largest with 25 million farmers insured. Yet 85 million farmer households are not covered. Issues in design, particularly related to delays in claim settlements, explain the low coverage. To address these problems, the World Bank provided actuarial inputs, engaged in policy dialogue, and facilitated the launch of an innovative crop insurance program that would improve equity, risk mitigation, and claim settlement for farmers; provide tools for budget management and for formulation of agricultural policy for government; and open up the market for public and private-sector insurers and reinsurers. Initially, the program will be available to an estimated 8 to 10 million
farmers, of whom 3 million are expected to participate in the first year with a total sum insured in excess of $1 billion. Over time, this project could be scaled up to be available to India’s 110 million farmers. This Smart Lesson describes lessons learned in developing and implementing the crop insurance program.36

The Need: With a high degree of dependence on rain-fed cultivation, India needs a well developed and widely used agriculture insurance program. For more than 110 million farmer households (of whom 80 percent are small and marginal farmers operating less than two hectares), access to risk mitigation for crop production is critical. Otherwise, they run the risk of crop failures, which in turn, leads to an inability to service debts. Because successive crop cycles follow seamlessly from one to the next, delinquency on account of one crop failure means being ruled out of the formal banking system, leading to dependence on high-cost informal sector credit and a potential debt trap. Crop insurance also helps enhance the viability of agriculture lending through risk mitigation and hence is vital for banks.

The government of India (GoI) has historically focused on crop insurance as a planned mechanism to mitigate the risks of natural perils on farm production. The National Agriculture Insurance Scheme (NAIS), implemented by the public crop insurer, the Agriculture Insurance Company of India (AICI), is the main crop insurance program in the country and has been supplemented more recently by the Weather-Based Crop Insurance Scheme (WBCIS). The broad structure of NAIS is technically sound and appropriate in the context of India. NAIS is based on an indexed approach known as the area yield-based approach, where the index used is the crop yield of a defined area called an insurance unit (IU, e.g., an administrative block). The actual yield of the insured crop, measured by crop-cutting experiments in the Insurance Unit, is compared to historical yields. If the farmer is lower than the latter, all insured farmers in the Insurance Unit are eligible for the same rate of indemnity payout. Individual crop insurance would have been virtually impossible, given the large number of very small landholdings. Further, using the area yield-based approach has other merits too. Most importantly, it mitigates moral hazards and adverse selection.

The Problem: NAIS is funded by post-disaster government contributions, entailing an open ended and highly variable fiscal exposure for the government. Being subsidized, the annual claim/farmers’ premium ratio is higher than 100 percent. At the end of the crop season, aggregate claims exceeding the farmers’ premium, are funded 50-50 by the state and central governments. India’s post-disaster funding arrangement, which, in turn, was necessitated on account of a lack of an actuarially sound premium rating methodology without which estimating payouts is not feasible, is not optimum for budget management for the GoI and delays claims settlement, leading to farmers’ distress and exposing them to a vicious debt cycle. This situation explains NAIS’s low coverage (20 percent) and that of banks’ lending to farmers (45 percent).

Figure 1.7
The Holistic Agricultural Development

The Solution: The Government of India (GoI) asked the World Bank to improve the crop insurance program through an actuarially sound rating methodology that would improve the design of NAIS and reduce delays in claims settlement. The Bank was asked to propose design and ratemaking of new weather-index insurance products under the WBCIS, perform a risk assessment of AICI’s insurance portfolio, and suggest cost effective risk financing solutions (including reinsurance).
The economic stability of an entire rural area can be jeopardized by crises caused by different types of natural disasters, from climatic events to livestock or plant diseases. Weather is an important production factor in agriculture, which, unfortunately, can hardly be controlled. In fact, weather risks are a major source of uncertainty for farms. Drought and excess rainfall are responsible for bad harvests all over the world. Besides, it seems that the volatility of temperature and precipitation and the occurrence of extreme weather events have increased in the last decade and are likely to continue increasing due to global climate changes. This leads to destabilization of farm incomes in particular in countries with strong yield variability. Perhaps the most obvious impact of weather risk is on crop yields, but its relevance is not limited to crop production. The performance of livestock farms, the turnover of processors, the use of chemicals and fertilizers and the demand for many food products also depend on the weather. Hence, large parts of the agribusiness are affected by weather risks. In India, the problem of production risk is even more relevant since price volatility is expected to increase due to recent policy reforms. Governments are not unaware of the importance of these risks. So, besides the private tools the producers can use to manage risks, many countries have decided to help the stabilization of their agriculture by supporting different agricultural risk management schemes. Agricultural insurance may be a useful tool for doing so. The study will be used by the Agriculture and Rural Department to further assess the potential of insurance systems as a tool for risk and crisis management in agriculture. The final motivation of the study is to improve the knowledge about climatic and other risks as well as Agriculture insurance in Indian agriculture in general and Jammu and Kashmir State in particular. Further, it is an effort to examine the role and the functioning of agricultural insurance as a risk management tool. Weather risk is a major challenge in agricultural policy, and it is important to have a new look at providing suitable information to analyze its possible integration in the common agricultural policy (CAP). Price and income risks are also to be considered. Sanitary crises and economic crises caused by the changes of market conditions may also endanger farms’ viability. The CAP should enhance efficacy of appropriate risk and crisis management strategies, providing an improved response to crises in the agricultural sector.
**Why India?**

The reason why I chose to research on Indian farmers was practical and theoretical. My interest in the long-term effect of Green Revolution and Agriculture Crop Insurance methods was stimulated by meeting Professor Jai Narain Sharma, Dr. Ashu Pasricha in Department of Gandhian and Peace Studies, Panjab University, Chandigarh, and Professor V.M. Rao in National Institute of Cooperative Management, Pune and Professor Ramesh Chand in National Center for Agriculture Economics and Policy Research (NCAP), New Delhi and Professor Surya Kant Sharma, Department of Geography, Panjab University, Chandigarh and hearing of the works being done in those Institutes in India to assist small scale farmers who are in debt. It was an opportunity I could not resist to access farmers who were struggling with Agriculture Crop Insurance methods to mitigate various risks and hazards. Also, India is one of the first countries in Asia nay the world which implemented the Agriculture Crop Insurance on a large scale during the time of Green Revolution Paradigm was adopted. The Green Revolution and Agriculture Crop Insurance were very successful there in terms of raising agriculture output, but it seems that the long-term financial and ecological damage that has been done warrants more research. Also, the farmers in Jammu and Kashmir seemed to have found a solution or alternative to Agriculture methods which helped them sustain income and prosper, and I desired to learn more about that approach.

**Why Small Scale farmers?**

Agriculture Insurance Company of India (AIC) deals with large, medium and small scale farmers. But I come from Persia (Iran) that falls in central Asia and Middle East as well as West Asia, where the predominant farm size is also small and it is the small farmers that require assistance in poverty reduction and sustainable livelihood options. Also, the major drive for an Agriculture Insurance in Persia is being focused on Small-scale farmers. Indian experience will be a lesson for policy makers and farmers.

**Why Jammu and Kashmir State farmers?**

Jammu and Kashmir is the end of North West of India. It is hilly, plain and valley and enjoys a variety of climate and produce. Agriculture and its allied activities are the predominant sector of the economy of Jammu and Kashmir. The land holding pattern is an important predetermining factor of economic and social development.
According to the eighth census report, released recently by the revenue department, the agriculture structure of the state portrayed Average size of operational land holding as 0.67 hectare which reflects no change in the holding size (pattern) in the seventh census (2000-2001). The only state in India with lesser average land holding than Jammu and Kashmir is Kerala (0.33 ha). The number of agricultural land holdings went up after land reform, a positive indicator of development. Eighth Agriculture Census depicts that the marginal holding shared 81.49% of the total number of operational holdings with a share of 44.06% area in the total operated area.

**Chaos Theory and Diffusion of Innovations Theory (Rogers’ theory), as an Underlying Research Framework**

The question of what does and does not work in agriculture crop Insurance system in rural area, or why some communities thrive (Andhra Pradesh and Kerala) and others flounder (Jammu and Kashmir), has led to this study on Agriculture Insurance. Thus my research question is based on a foundation of Chaos Theory which asserts that when several systems interact, it may appear chaotic, but in truth, a larger more complex system is created by the relationships of systems within.37 Chaos Theory is applicable to communities and to forms of economic development because of the inherent complexity and dynamism found in both. There is even a component of Chaos Theory that addresses the actions of entrepreneurs and the type of "system" that supports and magnifies their actions.

Historical agriculture insurance development models have been criticized as being too static, linear and rigid to explain the dynamics of the agriculture insurance development process and the complexity of community systems. Chaos Theory, which allows for complexity and interaction between systems, is a realistic backdrop on which to explore new agriculture insurance development models. Within Chaos Theory, “turbulence” or change in a given system is assumed, and is regarded not as a disturbance, but as a precursor to new configurations of the overall system as elements to which the systems adapt. Community evolution can in fact be regarded as a continuous cycle of turbulence and adaptation, noting that multiple adaptations occur simultaneously which in turn affect each other.

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Agriculture Insurance thrives in a “chaotic” environment because that setting allows flexibility and innovation. Environmental factors such as Climate Change influence Insurers not only in times of stability but especially "under conditions of environmental jolts," rapid or unusual change that provokes urgent or atypical response. Insurers find opportunity in the system’s turbulence and their reaction to the turbulence will likely create further turbulence. They might also cause the turbulence by a course of action whose impact ripples through the community. In either case, Insurers are a factor in the changes of a community system, and are under-researched in relation to the agriculture insurance development process.

**Diffusion of Innovations Theory (Rogers' theory)**

Rogers' theory originated from agricultural innovation in the late 1950s. Over the years, this model of diffusion of innovation has been applied to diverse fields including education. The key concept of the model is diffusion. Rogers defined diffusion as “the process by which an innovation is communicated through certain channels over time among the members of a social system.”38 This definition implies there are four main elements in the diffusion process: innovation, communication channels, time, and the social system. An innovation is “an idea, practice or object that is perceived as new by the individual”.39 A communication channel is “the mean by which messages get from one individual to another”.40 The third element, time, gets involved in diffusion in three aspects: (a) the innovation-decision process by which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, (b) the innovativeness of an individual’s relative earliness/lateness of adopting the innovation, and (c) the adoption rate in a system measured as the number of members of the system adopting the innovation in a given time. The last element, social system, is “a set of interrelated units that are engaged in joint problem solving to accomplish a goal”.41 The social and communication structure or the patterned arrangement of the units in the system facilitates or impedes the diffusion of innovations in the system. These four elements influence the adoption or rejection of an innovation in a complicated, interdependent way in a system.

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38 Ibid., p. 5.
39 Ibid., p. 12.
40 Ibid.
41 Ibid., p. 37.
Figure 1.8 shows the rates of successful adoption through time in a given population for an example of three different innovations. The rates of adoption tend to follow an S-shaped pattern. Diffusion is usually very slow in the beginning with only a few earlier adopters of the system.

Rogers' theory contains four major parts: adopter categories, perceived attributes, diffusion process, and rate of adoption. First, members of a population vary greatly in their willingness to adopt a particular innovation. Individual characteristics such as socio-economic features, personality traits, and communication behavior patterns can be used to divide the population into five categories - innovators, early adopters, early majority, late majority, and laggards. The frequencies of these five types of adopters closely form a normal distribution on the basis of the relative time at which an innovation is adopted, as shown in Figure 1.8. Innovators are active information seekers about new ideas. One of their salient characteristics is venture someness. They play a gate-keeping role in the flow of an innovation into a system. Early adopters are a “more integrated part of the local social system than are innovators”. They are usually not too far ahead of the average individual in innovativeness and they often serve as a role model for many other members in the system. The early majority adopt innovations just before the average number of a social system. Their innovation-decision process is relatively longer than that of innovators and the early majority. They usually “follow with deliberating willingness in adopting innovations but seldom lead”. The late majority are skeptical to new ideas. They adopt innovations just after the average number of the system, usually due to economic necessity or peer pressure. The social norms must definitely favor an innovation before the members of the late majority are convinced to adopt it. Laggards are the last group in the system to adopt an innovation. They tend to be suspicious of innovation or even resistant to innovation. Second, a person’s perception of an innovation influences the adoption decision.

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Ibid., p. 284.
Attributes of Innovations

Regardless of the nature and characteristics of people, the properties of an innovation itself affect its rate of adoption in the society. Rogers identifies five characteristics of innovations that help to explain different rates of adoption:

1. Relative advantage: the degree of considering the innovation is better alternative of the applied object. The greater degree individual perceives the advantages of an innovation, the more rapid its rate of adoption will be.

2. Compatibility: the degree of the consistency of the innovation with the existing values, past experience, and needs for potential adopters. If an idea is in consistent with the values of the society, it will not be adopted in the same rapidity as if it is compatible.

3. Complexity: innovations degree of difficulty to be understood and used. New ideas that are easy to comprehend are adopted more rapidly than those that require new skills.

4. Trialability: the degree to which an innovation may be experimented with on limited bases. The trial provides individuals with less uncertainty and gives them the opportunity to learn and practice by doing.

5. Observability is the degree to which the result of the innovation is visible to others. The visibility of positive result of the innovation enhances the possibility to be adopted.

Diffusion is a process that occurs over time and can be seen as having five distinct stages - knowledge, persuasion, decision, implementation, and confirmation (as shown in Figure 1.9). But, before an innovation is formally evaluated by an

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individual, four prior conditions must be met: (a) the person or unit of analysis needs to have previous experiences relevant to the innovation, (b) there is a perceived need or problem facing the individual to consider the innovation as an option, (c) the new ideas or techniques must have novelty or innovativeness, and (d) the norms of the social system should show some evidence favoring innovation. In the knowledge process, an individual is exposed to the existence of an innovation and gains an understanding of how it works. Three broad categories of personal characteristics—socioeconomic characteristics, personality traits, and communication behaviors—affect the extent to which the person possesses knowledge about the innovation. The next process, persuasion, occurs when an individual forms an attitude towards the innovation. The personal perception on the five attributes of an innovation plays a vital role in forming the favorable or unfavorable attitude towards innovation. In the next process, decision, the individual has decided to either adopt or reject the innovation and engaged in activities associated with the choice. In the implementation process, the individual puts the new idea or innovation into use, if deciding to adopt the innovation. In the final process, confirmation, an individual seeks reinforcement or revision of the decision being made. If the previous decision of adoption or rejection seems to be correct, the individual keeps the same choice; otherwise, the person reverses the previous decision.

Figure 1.9
A Model of Five Stages in The Innovation-Decision Process
(Adapted from: Rogers, 2003 p. 170)
Finally, the rate of adoption indicates the relative speed with which members of a social system adopt an innovation. Five broad categories of variables affect the adoption rate as shown in Figure 1.10, perceived attributes of an innovation, type of innovation-decision, communication channels, nature of the social system, and the extent of the changing agent’s promotion effort.

Rogers stated about 49-87% of the variance in the rate of adoption can be explained by the five categories of variables. The type of innovation-decision affects the rate of adoption in the sense that the greater the number of individuals involved in the decision process, the slower the rate of adoption. Thus, the optional innovation-decision category, which requires only an individual’s independent decision, was the fastest one, whereas the collective decision-process which needs consensus from most of the members of a system is slowest. Communication channels in the form of mass media make the rate of adoption faster than the means of interpersonal channels which often happen for later adopters. If a social system is highly structured, interconnected, and organized, the adoption rate of innovation is usually fast. In the last, the more promotion effort on innovation the change agent spends, the faster the rate of adoption, although the relationship between them is not linear.

Figure 1.10
Variables Determining the Rate of Adoption of Innovations
(Adapted from: Rogers, 2003, p.222)
Research Methodology

The study is basically an empirical work. This study is based on an analysis of primary and secondary data. Required data on production aspects and prices of selected crop was taken from publications of Central government and those of the state of Jammu and Kashmir. This state has a diverse set of crops covered under insurance scheme of government and it is one of the states where private sector insurance for agriculture does not exist and operate because Agriculture insurance in India is in public sector. Detailed information about Agriculture crop insurance at the national level were collected from the Agriculture Insurance Company of India Limited (AICL), New Delhi, Economic Survey 2011-2012, and Digest of statistics, published by Director of Economic and Statistics, and Reports of different Plan Working Groups on Risk Management in Agriculture, Planning Commission, Government of India. In order to understand ground level working of National Agricultural Insurance Scheme (NAIS) and Insurance products recently launched by some private sector companies, a case study was conducted in the state of Jammu and Kashmir. This involved survey of farmers who have been covered under NAIS, called beneficiaries and a control sample of farmers who were not covered under the crop insurance, called non-beneficiaries. The main aim of the field survey was to know the perception of beneficiaries and non-beneficiaries about National Agricultural Insurance Scheme NAIS.

Pilot Study

The pilot study was conducted over two months (June-July, 2011 and May-June, 2012) at Jammu province in Jammu and Kashmir State. Participants were selected on the basis of their coverage by Agriculture Insurance (National Agriculture Insurance Scheme). All participants were taken from the Research Experience Program. The data collected during the pilot study was analyzed with SPSS 18.0, and Excel. The data for missing values were examined; out of range responses, and other indications of poor data quality. Analysis was done on the basis of the performance of survey items in terms of response frequencies, measures of central tendency and variability, evidence of convergent and discriminant validity, and, where possible, for estimates of internal consistency reliability. Several tests for outliers were conducted, through the use of frequency distributions and plots of key
variables. In determining variables for modification or deletion, the variability of items and the number of missing responses were examined.

During May, June, July, August and September 2012, the Primary data was collected from 320 farmers in different districts. From each of these selected districts, two community development blocks each with highest area/farmers covered under NAIS were selected. For the purpose of understanding the process of implementation of NAIS and problems thereof, Jammu (plains) and Kashmir (hills) were selected for collection of primary data. These two parts are Jammu Province and Kashmir Province.

These provinces were treated as Divisions with 2 zones each. From each zone, four districts were selected (total 8 districts). From each district, 2 community development blocks were selected (16 blocks in all). The selection was made on the basis of highest concentration under NAIS. From the identified districts, a sample of 40 farmers (25 beneficiaries and 15 non-beneficiaries) was taken randomly from different size holdings. Thus, sample size consisted of 2 Parts of State, 2 Zones, 8 Districts, and 200 beneficiaries and 120 non-beneficiaries. Multi-stage stratified random sampling method was used. A schematic representation of the sample distribution is presented in Figure 1.11.

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44 Beneficiaries are those covered under NAIS while non-beneficiaries are not covered under insurance scheme (control sample of farmers).
A non-probability, purposive sample was used in this research. The sample was so selected because some of the respondents had Insurance cover and had banking loan responsibilities to perform. The sample size in this research was estimated with Cochran formula: The formula used for these calculations was:

\[
    n = \frac{x^2 \times N \times P \times (1-P)}{(ME^2 \times (N-1) + (x^2 \times P \times (1-P))^2)}
\]

Where:
- \( n \) = Sample Size
- \( x^2 \) = Chi-Square for specified confidential level at 1 degree of freedom
- \( N \) = Population Size
- \( P \) = Population proportion
- \( ME \) = desired margin of error (expressed as a proportion)
The study was conducted in 8 districts as they contained very important agriculture commodity growing areas of the Jammu and Kashmir State. The data regarding the total number of beneficiaries and non-beneficiaries (farmers), district-wise, was collected from office of Joint Director of Agriculture Office which is the Department responsible for the implementation of crop insurance scheme in the state. Based on this information, 8 districts were taken and from each district, 25 beneficiaries (farmers) and 15 non-beneficiaries (farmers) were selected (Table 1.4). Simple random sampling technique was adopted in the selection of farmers. A sample size of 320 farmers comprising of 200 beneficiaries (borrowers and non borrowers) and non- beneficiaries farmers and 120 non beneficiaries’ farmers were selected from the above districts.

**Table 1.4**

<table>
<thead>
<tr>
<th>Divisions</th>
<th>Districts</th>
<th>No. of beneficiaries (borrowers and non borrowers)</th>
<th>No. of Non Beneficiaries Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu</td>
<td>District 1</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 2</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 3</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 4</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td>Kashmir</td>
<td>District 5</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 6</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 7</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>District 8</td>
<td>25 (15 borrowers + 10 Non borrowers)</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Sample Size: 320

**Details of data**

The samples of beneficiary farmers (borrowers and non borrowers) were those who had agriculture activity during 2003-2012 and had paid their premiums. While the non- beneficiary farmers were those who had agriculture activity during 2003-2012, but had not enrolled under crop insurance. The data was collected from both the categories of farmers through personal interviews.
Collection of data

Information of primary data was collected mainly through survey questionnaire (see appendix I) under five main parts i.e. part 1 consisted of questions regarding the personal and general information and the specific information. Under general information, data was collected from the farmers regarding land utilization, cropping pattern such as Gender, type of farm management, level of formal and non-formal, professional education, size of family, category, average annual income of the household, land-holding and the details of the cost of cultivation of wheat, paddy, tomato and potato for the years 2003-2012. In part 2 of questionnaire, general attitude and opinion about Agriculture insurance was asked; i.e. the opinions of the farmers regarding various issues like awareness of the crop insurance programme, necessity of the proramme, risks faced in agriculture insurance, suggestions regarding the premium rates charged, the amount of compensation paid, the basis of threshold yields calculated and the method of conducting crop cutting experiments. In part 3 of questionnaire, the questions related to weather conditions/natural hazards, the most important natural hazards for Agri business were asked. In part 4 of the questionnaire, questions related to Farmers’ attitude to risk and farmers’ risk management issues and consequences of risk. In part 5 of the questionnaire contained questions that asked respondents to express their willingness to insure their crops. Thus the above data collected was the primary data which was collected directly from the farmers.

The secondary data regarding crop-wise and season-wise number of farmers insured, area covered, premium collected, claims paid in Jammu and Kashmir districts was collected from the Agriculture Insurance Company of India’s regional office at Chandigarh. The month-wise data on prices of Agriculture production in Jammu and Kashmir districts over a period of 20 years were collected from Department of Economics and statistics Government of Jammu and Kashmir State. Similarly, data about yield and rainfall covering 20 years and the agro-climatic features of the area under study like cropping pattern, cropping season, nature of soil, and weather phenomena were collected from Department of Economics and statistics Government of Jammu and Kashmir State, from its division head quarters at Srinagar and Jammu.
Review of Literature

In the absence of formal risk sharing/diffusion mechanisms, farmers rely on traditional modes and methods to deal with production risk in agriculture. Many cropping strategies and farming practices have been adopted in the absence of crop insurance for stabilizing crop revenue. Availability and effectiveness of these risk management strategies or insurance surrogates depend on public policies and demand for crop insurance.\(^{45}\)

The risk bearing capacity of an average farmer in the semi-arid tropics is very limited. A large farm household or a wealthy farmer is able to spread risk over time and space in several ways; he can use stored grains or savings during bad years; he can diversify his crop production across different plots. At a higher level of income and staying power, the farmer would opt for higher average yields or profits over a period of time even if it is achieved at the cost of high annual variability of output.\(^{46}\)

Binswanger (1980), after studying the risk in agricultural investments, risk averting tendencies of the farmers and available strategies for shifting risk, concludes that farmers’ own mechanisms for loss management or risk diffusion are very expensive in arid and semi-arid regions. The major role played by insurance programmes is the indemnification of risk-averse individuals who might be adversely affected by natural probabilistic phenomenon.\(^{47}\)

The philosophy of insurance market is based on large numbers where the incidence of risk is distributed over individuals. Insurance, by offering the possibility of shifting risks, enables individuals to engage in risky activities which they would not undertake otherwise.\(^{48}\)

Individuals cannot influence the nature and occurrence of the risky event. The insurance agency has fairly good but generalized information about the insurer. However, this does not hold true in the case of agriculture or crop insurance. Unlike


most other insurance situations, the incidence of crop risk is not independently or randomly distributed among the insured. Good or bad weather may affect the entire population in the area.

Lack of data on yield levels as well as risk position of the individual farmer puts the insurance company in a tight spot. As in the case of general insurance, agricultural insurance market also faces the problem of adverse selection and moral hazard. The higher premium rates discourage majority participation and only high risk clients participate leading to adverse selection. Moreover, in crop insurance, the individuals do not have control over the event, but depending on terms of contract, the individuals can affect the amount of indemnity. Tendency of moral hazard tempts an insured individual to take less care in preventing the loss than an uninsured counterpart when expected indemnity payments exceed the value of efforts. The imperfect information (gathering information is costly) discourages participation of private agencies in crop insurance market. Similarly, incidence of random events may not be independent. Natural disasters may severely damage crops over a very large area and the domain of insurance on which it is based crumbles down i.e., working of the law of large number on which premium and indemnity calculations are based breaks down. The private insurance companies of regional nature will go bankrupt while paying indemnity claims unless it spread risk over space. Farming or crop production being a biological process, converting input into output carries the greatest risk in farming. This, coupled with market risk, impinges on the profits expected from farming. Efficient risk reducing and loss management strategies such as crop insurance would enable the farmers to take substantial risks without being exposed to hardship. Access to formal risk diffusing mechanisms will induce farmers to maximize returns through adoption of riskier options. Investment in development of groundwater, purchase of exotic breeds for dairy will be encouraged due to insurability of the investment. This will help the individual to augment and increase the farm income (micro perspective) and also help to augment aggregate production in the country (macro perspective). The benefits of crop insurance vary depending on the nature and extent of protection provided by the scheme. It is argued that farmers' own measures to reduce the risk in farming in semi-arid tropical India were costly and relatively ineffective to adjust to drought and scarcity conditions. Jodha (1981) finds that the riskiness of farming impinges upon the
investment in agriculture leading to sub-optimal allocation of resources. He also finds that official credit institutions are ill-equipped to reduce the exposure of Indian farmers to risks because they cannot or do not provide consumption loans to drought-affected farmers.\textsuperscript{49}

Crop insurance is based on the principle of large numbers. The risk is distributed across space and time. The losses suffered by farmers in a particular locality are borne by farmers in other areas or the reserves accumulated through premiums in good years can be used to pay the indemnities. Thus, a good crop insurance programme combines both self as well as mutual help principle. Crop insurance brings in security and stability in farm income. Crop insurance protects farmers’ investment in crop production and thus improves their risk bearing capacity. Crop insurance facilitates adoption of improved technologies, encourages higher investment resulting in higher agricultural production.

Crop credit insurance also reduces the risk of becoming defaulter of institutional credit. The reimbursement of indemnities in the case of crop failure enables the farmer to repay his debts and thus, his credit line with the formal financial institutions is maintained intact.\textsuperscript{50}

The farmers do not have to seek loans from private moneylenders. The farmer does not have to go for distress sale of his produce to repay private debts. Credit insurance ensures repayment of credit, which helps in maintaining the viability of formal credit institutions. The government is relieved from large expenditures incurred for writing-off agricultural loans, providing relief and distress loans etc., in the case of crop failure. A properly designed and implemented crop insurance programme will protect the numerous vulnerable small and marginal farmers from hardship, bring in stability in the farm incomes and increase the farm production.\textsuperscript{51}

\begin{itemize}
\item \textsuperscript{49} Jodha, N.S., “Role of Credit in Farmers Adjustment Against Risk in Arid and Semi-Arid Tropical Areas of India.” \textit{Economic and Political Weekly}, Vol. XVI, Nos. 22&23, 1981.
\end{itemize}
The farmer is likely to allocate resources in profit maximizing way if he is sure that he will be compensated when his income is catastrophically low for reasons beyond his control. A farmer may grow more profitable crops even though they are risky. Similarly, a farmer may adopt improved but uncertain technology when he is assured of compensation in case of failure. This will increase value added from agriculture, and thus increase the income of the farm family. Access and availability of insurance, changes the attitude of the farmer and induces him to take decisions which, otherwise, he would not have taken due to aversion to risk. For example, rain-fed paddy was cultivated in one of the riskiest districts i.e. Anuradhapura district of Sri Lanka, for the first time in 1962, as insurance facility was available to the farmers.

Jacqueline, Diaz, Neito, (2011), say in “A System of Drought Insurance for Poverty Alleviation in Rural Areas”, that agriculture is inherently risky. Drought is a particularly troublesome hazard that has a documented adverse impact on agricultural development. The poor has little access to risk-minimization methods used by others. They therefore seek to avoid risk by minimizing there exposure to it. He talked about the importance of insurance for covering risk. In developed countries farmers widely use there insurance to protect them against weather risk.

Roberts, R. A. J., (2010), says in her work, “Insurance of Crops in Developing Countries” that natural disasters hit hard. They may cause heavy losses to farmers and forest owners. Insurance can assist in managing these losses, and crop insurance is that branch of this financial mechanism that is especially geared to covering losses from adverse weather and similar events beyond the control of growers.

Hazell, Peter, Carlos Pomareda and Alberto Valdes (2007), discuss the issue in their edited book “Crop Insurance for Agricultural Development” and highlighted lack of data on yield levels as well as risk position of the individual farmer puts the insurance company in tight spot. As in the case of general insurance, agricultural insurance market also faces the problem of adverse selection and moral hazard. The

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higher premium rates discourage majority participation and only high risk clients participate leading to adverse selection.

Bhende (2005) found that income of the farm households from semi-arid tropics engaged predominantly in rain-fed farming was positively associated with the level of risk. Hence, the availability of formal instrument for diffusion of risk like crop insurance will facilitate farmers to adopt risky but remunerative technology and farm activities, resulting in increased income.\(^5^3\) Some of the studies confirm the conventional view that moral hazard incentive led insured farmers to use fewer chemical inputs.\(^5^4\)

Babcock and Hennessy (1996), find that at reasonable levels of risk aversion, nitrogen fertilizer and insurance are substitutes, suggesting that those who purchase insurance are likely to decrease nitrogen fertilizer applications.\(^5^5\)

A study by Horowitz and Lichtenberg (1993) find that in the US Midwest, crop insurance exerts considerable influence on maize farmers' chemical use decisions. Those purchasing insurance applies significantly more nitrogen per acre (19 %), spend more on pesticides (21 %), and treats more acreage with both herbicides and insecticides (7 % and 63 %) than those not purchasing insurance. These results suggest that both fertilizer and pesticides may be risk-increasing inputs.\(^5^6\) An analysis of data from US agriculture indicates that the producer's first response to risk is to restrict the use of debt. Price support programmes and crop insurance are substitutes in reducing producer risk. The availability of crop insurance in a setting with price supports allows producers to service higher levels of debt with no increase in risk.\(^5^7\)

Mishra (1994) analyzed the impact of a credit-linked Comprehensive Crop Insurance Scheme (CCIS) on crop loans, especially to small farmers in Gujarat. It is

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observed that CCIS had a collateral effect as reflected through the increased loan amount per borrower and reduction in the proportion of non-borrowers among small farmers. The implications of credit expansion are that increased availability of credit can enhance input use and increase output and employment that increased share of small farmers in the total loans can have desirable effects on equity and efficiency considerations. Although crop insurance is based on area yield yet it insures the loan amount. This leads to improved access of small and marginal farmers to institutional credit. In the event of crop failure or drought, loan is repaid in the form of indemnity and thus there is reduction in the cost of recovery of loans to lending institutions and reduction also in the overdue and defaults. It is observed that the insured households invest more on agricultural inputs leading to higher output and in income per unit of land. Interestingly, percentage increase in output and income is more for small farms. Based on 1991 data, CCIS was found to contribute 23, 15, and 29 per cent increase in income of insured farmers in Gujarat, Oriissa and Tamil Nadu, respectively. Many of the risks insured under public insurance programme are essentially un-insurable risks. Moreover, they occur frequently and hence are expensive to insure. The financial performance of most of the public crop insurance schemes/programmes has been ruinous in both developed and developing countries. The multi-peril crop insurance thus is very expensive and has to be heavily subsidized. In an effort to appreciate fully the various concepts in crop insurance, a review of various studies conducted in the relevant field is brought out in this chapter. The reviews are organized under the following headings:

A.I. Concepts of Risks and Uncertainties. A.II. Approaches to Agriculture Insurance. A.III. Methods used in determining premium rates A.IV. Agriculture insurance in other countries. A.V. Agriculture insurance in India

A.I. Concepts of Risks and Uncertainties
Hasanabadi, M. S. (2005)60, According to Knight (1971) brought out the difference between risks and uncertainties. He indicated that in case of risks, the distribution of outcome in a group of instances is known while in case of uncertainty, this is not

59 Ibid.
true. The reason being that it is impossible to form a group of instances. Thus risk is insurable since it is for one individual. However, if such individuals join together, the loss probability can be calculated and the premium can be estimated for a group of individuals.61

Kurian (1978) conducted a study on the behaviour under uncertainty and public policies in peasant agriculture. The study suggested suitable modifications in the existing public policies and recommend about measures in the light of the theoretical results obtained.62

These include the effective implementation of land reforms, systematic investments in minor irrigation and other risk reducing measures as well as social services and introduction of crop insurance programme along with the progressive agricultural income taxation.

Rajagopalan and Varadarajan (1978), in an attempt to study the impact of risks and uncertainties on farm production and income in the hilly areas, indicated that diffusion of technology helps in minimizing risks and also protects the farmers in general. The study also indicates that hill farming was not only faced with a limited scope of diversification, but also an efficient investment decision in favour of modern farming. In order to minimize risks, the authors recommended mixed cropping, mixed farming and improved marketing practices.63

Singh and Jain (1983) undertook a study to work out risk efficient plans for different sizes and categories of farms. Quadratic programming has been suggested as the most important tool for incorporating risk in farm planning. In this study it was assumed that risk in net returns is due to yield and price factors. The results indicated that a high degree of risk was involved in the existing plans of the farmers. The authors suggested the need to provide alternative plans, precisely indicating the degree of corresponding risk involved to the farmers. The farmers could choose the

plans according to their personal attitude to the risk. This knowledge could be of immense help in farm decision-making under risky situations.\textsuperscript{64}

Kalirajan and Haysman (1984) adopted Swamy’s random coefficient model to estimate the inter-year variability in the fixed effects of the decision input variables. The study indicated a strong responsiveness of output to the inter-season variabilities. An increase in the scale of chemical inputs such as fertilizer had a relatively mild impact on the marginal productivity. The authors indicated that under these circumstances, fertilizer subsidy may not yield fruitful results and suggested provision of new varieties to be a desirable incentive for rainfed conditions.\textsuperscript{65}

Awasthi \textit{et al}. (1987) analyzed the nature and the extent of risk associated with the production of rice. The study was based on the time series data on area, production, yield and price of rice. The variation of each variable and production variability of rice was measured through coefficient of variation. The study concludes that the paddy crop is highly sensitive to weather and an important implication of such a situation was to have crop insurance in the form of a regressive tax.\textsuperscript{66}

Singh and Sharma (1988) attempted to highlight the risk element in farm business on unirrigated farms. The magnitude of risk in yields, product prices, variable cost and gross margins per farm were determined by computing the coefficients of variation. The findings indicated that livestock enterprises were relatively more stable than the crop enterprises. Further, the livestock enterprises were associated with a smaller amount of risk compared with the crop activities.\textsuperscript{67}

Abbaspour (1996) conducted a study on Bayesian risk methodology for insurance decisions. This Bayesian risk methodology is outlined for making decisions under


\textsuperscript{67} Singh, R. Sharma, A.C., “Risk Element in form Business on Irrigated Farms in Sub Mountainous Areas of Roopnagar District of Punjab”, \textit{Agriculture Situation in India}, Vol. 42, No. 11, 1988, pp. 981-983.
uncertainty. A practical example was given for crop insurance where the insurer decides how to take risks. Risk to the insurer arises from the uncertainty and variation in input variable of a previously developed deterministic yield model and suggested that this methodology is general and can be used in many situations to determine the risk in a project from uncertain inputs.

James Hanson et al (2004) conducted a study on risk and risk management in organic agriculture by collecting views of organic farmers. In a series of focus groups during 2001 and 2002, organic farmers from different regions of the United States identified a wide range of risks to their operations. The focus groups were facilitated by the University of Maryland in cooperation with a research team to explore the risks faced by organic farmers - how they are managed and the needs for risk management assistance. Contamination of organic production from genetically modified organisms was seen as a major risk, particularly by the grain, soybean and cotton farmers. Focus group participants producing grains and cotton knew about and had obtained crop insurance but most fruit and vegetable producers participating in the focus groups had little knowledge of crop insurance.

AII. Approaches to Agriculture Insurance

Halcrow (1978) was of the opinion that of the types of crop insurance i.e. the all-risk crop insurance, area yield crop insurance and the weather crop insurance, it was the area yield and weather crop insurance which were preferable and more reliable than the all risk crop insurance especially in providing income protection for the individual farmers against the risks of low crop yield.

Ahsan et al (1982) provided a simple, yet general theoretical framework of agricultural insurance that may be used to explore its possibilities as a market enterprise or a state-run programme. The authors indicated that first, it is the market insurance with the public sector as a source of information gathering and dissemination and, second, it is the direct provision of crop insurance by the public

sector. Their study focused on the latter and developed a model of public insurance as a decentralized plan where the farmer determines factor utilization taking the insurance contract as given. In turn, the insurance agency, taking factor utilization as determined by the farmer, chooses the optimal contract so as to maximize the value of aggregate output in the economy.\textsuperscript{71}

Walker and Jodha (1982) have highlighted a few implications of crop insurance. It was indicated that the programme should be designed with a minimum of lacuna so that the integrity of the farm risk management was preserved. It was concluded that heterogeneity of productive micro environment may allow regional crop insurance programmes to pool risks more widely over many areas and small farmers may also be able to diffuse risk through spatial diversification and other mechanisms.\textsuperscript{72}

Kouadio (1983) analyzed the implications of the availability of the Federal Crop Insurance Programme on the risk taking behaviour and social welfare of the farmers in Arizona. Analytically, a simple model of the allocation of land between two crops. One crop can be safe and the other risky in yield. The model was used along with the behaviour hypothesis of expected utility maximization.\textsuperscript{73}

A subsidized programme will in general induce greater risk taking behaviour. The impact of the programme on crop mix was, however, ambitious when the expected insurance indemnities fell short of the premium paid. If insurance was available, under some reasonable assumptions about farmers’ risk preferences, a premium subsidy would tend to induce greater risk-taking. However, the results of the empirical study suggested that the Federal Crop Insurance Programme did not have a significant effect on crop mix. Finally, using the arrow lined criterion of welfare assessment under uncertainty, the study cast doubt on the social desirability of the Federal Crop Insurance Programme.

Neuwoudt (1984) studied the viability of the United States Crop Insurance Programme with a view to draw some policy conclusions on the feasibility of such a


scheme for South Africa. The study concluded that when crop insurance is initiated through farmers’ cooperatives, it should be welcomed since it promotes greater stability in agriculture and more rational decision making. The author also cautions that the programme should not rush into a comprehensive state supported crop insurance programme such as that is followed in the United States since it could absorb millions of money in state subsidies.\(^74\)

Hazell and Valdes (1985) indicated that risks and uncertainty pose a serious impediment to agricultural development. One method of setting risks to farmers is through crop insurance. Their study also covers the economic theory behind crop insurance. It was pointed that high administrative costs of crop insurance make government subsidies a requirement. It was suggested that if the crop insurance programmes were to be useful in agricultural development, it must be carefully reworked to maximize their efficiency for both farmers and governments.\(^75\)

Walker \(^et \al\) (1986) indicated that the participation by Indian farmers in voluntary public sector crop insurance programmes has historically been low. Their study analyzed the important determinant of farmers’ participation and the potential for crop insurance to reduce household income variability. Based on simulated crop insurance designs carried out on household panel data, it was found that crop insurance was not effective in smoothing out fluctuations in income. The simulation results point to some general conditions that have to be satisfied if crop insurance is to generate measurable risk benefits. Crop insurance in dryland agriculture has to be content with area variability, which can largely be attributed to the response of households to rainfall events. It was concluded that the institutional alternatives were superior to crop insurance as a means of reducing income variability for a large number of rural households.\(^76\)

Ramaswami (1993) studied the supply response to Agricultural Insurance, Risk reduction and moral hazard effects. This study examines the consequences of agricultural insurance for expected supply. The effect of insurance is shown to

\(^{75}\) Hazell, P.P., Valdes, A., Crop Insurance for Agricultural Development. Issues and Experience, op. cit.
decompose into a “risk reduction” effect as well as a “moral hazard” effect. The direction and magnitude of these effects depend on the parameters of the insurance contract, producer’s risk preferences, and the underlying technology. Two models are considered for this purpose. The author found that the insurance changes the marginal costs and input use in two ways. First, insurance reduces risk, and therefore, reduces the wedge between expected marginal product and input price due to risk aversion. Secondly, insurance reduces the marginal productivity of all inputs and suggested that in evaluating alternative insurance schemes, simulation exercises could be used to assess the trade-off between risk reduction and moral hazard effects.77

James Vercammen et al (1994) conducted research on moral hazard cycles in Individual Coverage Crop Insurance. The study suggested that individual coverage contracts are informatically superior to standard contracts because the farmer’s coverage is proportional to his average historical yield. The amplitude of the cycle and the variability in planned production is shown to be larger, the lower the degree of production uncertainty. The fewer the number of years used in the averaging process, the higher the coverage threshold, and the lower the level of co-insurance.

Charles et al (1997) conducted study on costly yield verification, moral hazard, and crop insurance contract form. This study is based on theories of hidden-action, moral hazard and costly state verification are drawn on to analyse crop insurance contract structure. The hidden action moral hazard model allows few clear predictions regarding optimal contract form. In particular, the conditions under which actual contracts are optimal are not clear. Posing crop insurance as a problem of costly yield verification, however, results in optimal contracts with familiar properties a deductible indemnification if and only if yield is verified, and indemnification only when yield is low. However, these contracts require full insurance across low yield states, while actual contracts typically involve co-insurance. This model is then generalized to incorporate hidden-action moral hazard, and it is shown that optimal contracts then require co-insurance. Thus, this model reflects the essential features of actual contracts. It was suggested that recognizing the incentives for misreporting

and for insurers to economize on yield verification costs will potentially result in a better understanding of crop insurance.

Vercammen (2000) conducted a study on constrained efficient contracts for area yield crop insurance; indemnification occurs when area yield falls below a yield trigger that is chosen by the producer. The maximum value for this yield trigger is generally restricted (e.g. 80% of the long term area average yield). The impact of this trigger constraint on the optimal design of an area yield insurance contract is examined. Within the constrained efficient contract, indemnities consist of both a lump sum payment and a payment that is proportional to the yield short-fall. Because lump sum payments may not be feasible to implement, the study suggested efficiency enhancing modifications to standard contracts.

Rodrick et al (2005) conducted study on share tenancy, ownership structure and prevented planting claims in crop insurance. A conceptual model, based on opportunity cost and expected utility principles, establishes linkages between the likelihood of prevented planting claims in crop insurance and existing share leasing arrangements/internal farm business structures. Results of hetero-stedastic prohibit estimation procedures indicate that simpler internal business structures and more dominant tenant leasing position can increase the probability of submitting a prevented planting claim.

A.III. Methods Used in Determining Premium Rates

Botts (1941) made an attempt to estimate the premium rates for ‘normal’ citrus fruit yields by taking tree ages into consideration for formulating the area yield insurance plan. He considered the yield rating wherein the production of a particular fruit groove was compared with the normal yields. The procedure used was as follows:

\[
\text{The yield rating} = \sum Y_i - \sum N_i
\]

Where,

\(N\) = Normal yield based on a large sample for the \(i^{th}\) year of tree age

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\[ \sum N_i = \text{The sum of the normal yields based on a large sample for different years of tree ages} \]

\[ Y = \text{Actual yield of the trees at their } i\text{th year of age} \]

\[ \sum Y_i = \text{Sum of the actual yields of trees of different years of ages} \]

\[ E_i = \text{Expected yield for the particular grove for the } i^{\text{th}} \text{ year of tree age} \]

\[ E_i = \sum Y_i + \sum N_i \times N_i \]

\[ C_i = P \times \sum Y_i + \sum N_i \times E_i \]

The annual loss for the \( i^{\text{th}} \) year = Coverage \( C_i \) – Actual yield \( Y_i \).

Premium rate = Total of annual losses for all years ÷ Number of seasons

In 1958, Botts and Boles presented a paper wherein the normal curve principle was used in premium rate calculation. This technique is presently used by the Federal Crop Insurance Corporation of the United States Department of Agriculture. A crucial condition to be fulfilled in using this technique is that the frequency distribution at annual yields of individual farms must be relatively normal, so as to facilitate the use of density and frequency functions.\(^1\)

Botts (1962) indicated that the premium amount should be a variable cost depending upon the yield obtained by the farmer and the number of hectares on which the insured crop is grown as well as a predetermined price. If this method is adopted, then the farmer would make most of the premium payments in those years when he obtains high yields and would pay little in those years when the yields are low.\(^2\)

Martin and Roland (1966) evaluated the basic principles of premium rate making. They indicated that the premium rates should be adjusted only when there exists a trend due to technology and cyclical movement in weather and in the distribution of crop yield over time. The major factors which influence the long term crop yields such as resource (R), technology (T), weather (W) and residual (F) were used in calculating the average premium.\(^3\)

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Borude and Joglekar (1971) observed that under tropical dry farming conditions, the average yields per acre were low and the fluctuation in yields was very high. The authors indicated that the premium should be expressed in terms of percentage of the average yield. They indicated that it would be useful in deciding whether the premium is within the paying capacity of the farmers.\textsuperscript{84}

Singh (1972) conducted a feasibility study of crop insurance in Uttar Pradesh wherein he has emphasized that crop insurance should be based on the principle that a portion of savings in the good years is used to compensate farmers by giving them indemnity for their low yields in years of natural calamities. The extent of crop yield variability was measured by variance-standard deviation and coefficient of variation. To evaluate the effectiveness of crop insurance, a linear programming model was used.\textsuperscript{85}

Dandekar (1976) developed a feasible crop insurance scheme based on area approach. The premium rates were calculated based on the yield variability. He also indicated that the area approach was more meaningful than the individual approach.\textsuperscript{86}

Battese and Francisco (1979) conducted a study on the distribution of indemnities for crop insurance programmes in South Wales. The general formulae for the distribution function and the mathematical expectations and indemnities for the insurance plan were presented in terms of distribution of crop yields. Three special cases were considered in which the original yields, the square root of yields and the logarithms of yields were normally distributed. Given the distributional information on the crops obtained from a simulation model, the expected indemnities were calculated for different insurance plans.\textsuperscript{87}


Pandey et al (1981) used the coefficient of variation to study the rainfall, yield and gross income variability over a period of eleven years. The premium rates were worked out for a few crops and the basis of selection of these crops was the degree of risk attached in crop production as well as the economic significance of the crop. The net premium rate was the annual average loss per hectare and was expressed in physical quantities. This was converted into money value of some previously agreed price. The level of guarantee or coverage is given as a certain percentage of the long term average yield varied according to the degree of risk involved in crop production.

In India, the Central Government has introduced a country-wide crop insurance scheme which commenced from kharif 1985. In this scheme, the insurance charges or premium is 2 percent of the sum insured for rice, wheat and millets and 1 percent for oil-seeds and pulses. The basis of indemnity is determined in the following manner. If there is a short fall in the actual average yield per hectare of the insured crop, all the insured farmers growing that crop in the defined area will be eligible for indemnity which is calculated as follows:

\[ \text{Indemnity} = \frac{\text{Shortfall in yield} \times \text{sum insured per farmer}}{\text{Threshold yield}} \]

(*Threshold yield less the actual average yield for the defined area)

The threshold yield will be decided in the following manner:

The average yield per hectare of the crop for the “defined area” during the previous five years (or such shorter period as may be decided for a specific crop) for which data, available based on crop cutting experiments is obtained. The threshold yield is determined by considering 80 per cent of this five years average yield per hectare.

Abada (1987), in his study, provides possible measures for determining coverage, premium and premium rating. The author indicates that the average yield on a per unit area, expected returns from cultivation, actual production cost and the level of crop loan extended, should serve as a basis for fixing the amount of cover or sum

\[ \text{References} \]

insured. He opined that whichever basis is used, the sum insured in all cases will be always below the actual value of the harvested crops under normal conditions.89

Ryohel (1987) tried to examine the basic issues of management and financing of crop insurance scheme, based largely on the long Japanese experience. The amount of insurance is the maximum yield covered by the insurance scheme as an important element for indemnity computation.90

Charles (1996) conducted a study on crop insurance and the relationship between indemnity price and expected output price. Crop insurance contracts typically constrain the choice of price at which indemnification occurs to be less than the expected output price. This restriction is first analyzed assuming only risk averse farmers and yield and price uncertainty.91

General conditions under which the optimal price selection is bounded above by the expected output price are found to be difficult to derive. The results of numerical simulations based on a range of different utility functional forms are presented, and a strong tendency is observed for the optimal price selection to be bounded from below by the expected output price. The effect of increasing output price variability on the optimal price selection is also considered. The simulation results suggest that the optimal price selection is often non-increasing. With a mean preserving spread of the output price distribution, it is noted that even in the presence of hidden-action moral hazard if the incentives for shirking are not too high, the constraint that price selections be lower than the expected output price may still be binding.

Keith et al (1997) conducted a study on the expected indemnity approach to the measurement of moral hazard in crop insurance. This study includes a definition of moral hazard in multiple-peril crop insurance that focuses on expected indemnities rather than input use. Five years of production and insurance data for a panel of Kansas wheat farms were used to empirically test this type of moral hazard. Results suggest that moral hazard affects multiple peril crop insurance indemnities in poor...
production years but that no significant moral hazard occurs in years when growing conditions are favourable.\textsuperscript{92}

Jerry \textit{et al} (1997) conducted study on designing and rating an area yield crop insurance contract. This study documents the design and rate making procedures used in the development of the group risk plan (GRP) – the new federal crop insurance product that insures based on area yield. The study suggested that the GRP indemnity payments are made based on percentage shortfalls in actual county yields relative to forecasted yield and historical country yield data are used to develop forecasted yields and premium rates.\textsuperscript{93}

Babcock \textit{et al} (2004) conducted a study on actuarial fairness of crop insurance rates with constant rate relativities. Increased availability and demand for low deductible crop insurance policies have increased focus on crop insurance rating methods. Actuarial fairness cannot be achieved if constant multiplicative factors used to determine how premiums change as coverage level increases. A comparison at premium rate generated by the factors used by the two most popular crop insurance products with those generated by a standard yield distribution shows that the popular insurance products over charge for low deductible policies in most countries and suggested that this overpricing may explain why large premium subsidies were required to induce farmers to move from low-deductible to high-deductible policies beginning in 2001.\textsuperscript{94}

\textbf{A.IV. Agriculture Insurance in Other Countries}

Ray (1960), in his study, reviewed the need and importance of crop insurance and also examined the position in countries operating crop insurance programmes. The author identified the major factors which seem to stand in the way of rapid progress of the crop insurance scheme.\textsuperscript{95} According to him, priority should be given for the

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improvement of various technical and physical factors affecting agriculture. On the economic side, more attention should be given to more credit. Since experiences have shown that, in many cases, the allocations to agriculture have been adequate, thus the need for all-risk or multi-risk crop insurance will depend largely on the realization of its need by the appropriate authorities and also by lifting the well of skepticism and uncertainty that still prevails regarding the possibility.

Sanderatane (1969) highlighted the inherent difficulties in Sri Lanka’s crop insurance scheme. Some of the difficulties pointed are that the scheme has run the risk of providing inadequate coverage and inequitable premium rates due to the averaging of premium rates, a high level of government subsidization and the inability to collect premium dues. These difficulties suggest that crop insurance scheme should be effectively dovetailed and integrated with other agricultural programmes since the eligibility to the benefits at each of such programmes depends upon on the commitment at all.96

Sulzhik (1978) made a criticism of the methods used in the Soviet Union in calculating insurance premium for yield deficiencies in crop production; the limiting of the insurance payment did not provide any help to the farms concerned. Her suggested that, in future, the benefits should be granted for losses in crop production branch as a whole rather than the individual crop approach. In this way, the number of cases of losses could be reduced by about half and in individual cases, the sum to be paid could be raised.97

Crawford (1979) excerpts assert that some of the problems faced by the developing countries in the operation of such programmes, seriously limit the probability of success and decreases the level of benefits realized. Many of the problems faced by the programme involved institutional constraints which sometimes manifest themselves as an inability to perform the needed operational tasks. He indicated that the farmers’ lack of education, small and fragmented land holdings, vaguely defined tenured patterns and absence of land records greatly increased the cost and the

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administrative problems of operating a crop insurance programme in developing countries.  

Yamauchi (1980), in his study, describes the type, pattern and frequency of natural hazards for rice farming in Thailand and then examined the farmers’ demand for crop insurance in relation to farmers’ income and the possibility of exposure to natural hazards. Suggestions for possible insurance units, amount and coverage, premium rating, loss adjustment method, etc., and recommendations for a pilot scheme, were made.  

Ahasan (1983) reviewed the pilot crop insurance scheme operated in Bangladesh since 1977 and pointed out that the practice of having a voluntary scheme with uniform highly subsidized premium rates throughout the country encourages adverse selection. An individual approach, coupled with inadequate provisions of co-insurance on the other hand increases the risk of fraud. Both these factors, he indicated, have contributed towards the very high loss rates. It was thus suggested that in order to make the scheme a national programme, one has to move away from the individual approach to an area approach of insurance which would eliminate the risk of fraud. An area approach, applied on some form of a compulsory basis, also does away with the problem of adverse selection.  

Mairo et al (1997) studied systemic risk, reinsurance and the failure of crop insurance. The markets they felt that without affordable reinsurance, private crop insurance markets are doomed to fail because systemic weather effects induce high correlation among farm level yields and defeating insurer efforts to pool risks across farms. Using an empirical model of the U.S. crop insurance market, they found that area yield reinsurance contracts would enable crop insurers to cover most of their systemic crop loss risk, reducing their risk exposure to levels typically experienced by more conventional property liability insurers.  

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Mahul and Vermersch (2000) studied hedging crop risk with yield insurance futures and options. This study analyses the optimal hedging decisions for risk-averse producers facing crop risk, assuming crop yield insurance futures and options available. The first best optimal hedge requires either a futures position or an option proportional to the regression coefficient of individual yield on aggregate yield depending on whether the financial markets are unbiased or biased. Using yield data for a sample of wheat producers in France, the producers’ hedge ratios are derived. The study suggests that these new hedging instruments are usually more effective to reduce farm yield variability than individual yield contracts.\textsuperscript{102}

Clover and Nieuwoudt (2003) conducted an economic evaluation of area yield insurance for small scale cane growers. In this study, principles of area yield insurance were applied to yield data on small scale cane growers in Kwazulu-Natal and used to calculate pure premium rates. The viability of a government subsidized area yield insurance scheme for small scale cane growers was assessed in terms of affordability to the government, the farmers and private insurance companies. The empirical results obtained from this study indicate that such a scheme may pose great expense to the government and as a result may not be viable in South Africa, and this topic needs further study, while other risk management strategies should also be considered.\textsuperscript{103}

Sherrick \textit{et al} (2004) conducted a study on crop insurance valuation under alternative yield distributions. The results of this study demonstrate that large differences in expected payouts from popular crop insurance products can arise solely from the parameterization choices to represent yield distributions. The results suggest that the frequently unexamined yield distribution specification may lead to economically significant errors in crop insurance policy rating and assessment of expected payouts from policies.\textsuperscript{104}


Barry et al (2004) studied an empirical analysis of acreage effects of participation in the lateral crop insurance programme. They considered multi-equation structural models of acreage response, insurance participation, CRP enrollment and input usage. This analysis focuses on corn and soy bean production in the Corn Belt and wheat and barley production in the upper great plains; the results confirm that increased participation in insurance programmes provokes statistically significant acreage responses in some cases, though the response is very modest in many cases. A number of policy simulations involving increases in premium subsidies are considered.\textsuperscript{105}

\textbf{A.V. Agriculture Insurance in India}

Singh (1967) reviewed the importance of crop insurance in Uttar Pradesh. It was indicated that for a crop insurance programme to run on a sound basis, the continued support of the farmers was essential.\textsuperscript{106}

Nadkarni (1971) measured the uncertainty in yield in terms of deviations from the “normal yields”. It was indicated that, in general, the regions which have higher levels of yields also have higher rate of increase in yields and a higher level of uncertainty. The results bear important implications for crop insurance. One of the implications in such a situation for crop insurance would be that if uniform premium rates were imposed in all regions, they would be like a regressive tax, wherein the farmers in low yield regions would be paying more through premium than they would receive through indemnities. This would, in the process, result in financing a part of the indemnities paid to the farmers in the high yield regions.\textsuperscript{107}

Singh (1972) conducted a feasibility study of crop insurance in Uttar Pradesh. He measured the extent of crop yield variability. The results indicated that fluctuations in crop production were a chronic problem. Among the food crops during the period 1951-70, the degree of yield variability was the highest in bajra. He suggested crop insurance to be a feasible programme since it appears to be self-sustaining in the

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\textsuperscript{106} Singh, I.J., “Crop Yield Instability and Crop Insurance”, Agricultural Situation in India, Vol. 12, No. 5, 1967, pp. 503-507.\\
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long run. Diversification stabilizes farm income and was at a higher level than the crop insurance programme. The author suggested crop insurance to be a better alternative to diversification.108

Chandrakanth (1976), in his study on the feasibility of crop insurance for potato in Hassan taluk, Karnataka, computed the premiums based on the normal curve plan, the area yield insurance plan, the quality based premium plan and the variable premium plan. The study results indicated that the normal curve approach was applicable for estimating the pure premiums. It was concluded that the failure of rains and the use of poor quality tubers were the main causes of yield variability. A pilot crop insurance scheme was suggested with a subsidy at least to the extent of administered cost by the government.109

Choudary (1977) conducted a study on an evaluation of the crop insurance scheme for commercial H-4 cotton. The study indicated that there has to be a better understanding and effective co-ordination between the insurance, credit and marketing agencies. Individual approach though more elaborate and scientific, was not likely to succeed in practice. The area approach was considered as a better alternative. The primary responsibility of initiating the scheme, he indicated, was with the General Insurance Corporation and the state governments.110

Shobharani, (1989) made an attempt to analyze the nature and extent of yield variation, compute premium rates and to arrive at feasibility of crop insurance for coffee in south Kodago district, Karnataka. The study suggested crop insurance scheme to be introduced on a pilot basis for coffee covering all estates. The compulsory group premium scheme with individual indemnity was also suggested.111

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110 Choudhary, K.M., Crop Insurance Scheme For Hybrid-4 Cotton in Gujarat (Vallabhbhisnana, Gujarat: Agro Economic Research Centre, Sardar Patel University), 1977.
Pathak (1986) argued that through crop insurance, farmers could purchase the right for compensation by paying only a small amount and that they are assured of protection against uncertainties.\(^\text{112}\)

Rustagi (1988) analyzed the viability of the pilot crop insurance programme in India. He was of the opinion that crop insurance programmes for multiple risks suffer from the problems of moral hazards and adverse selection. It was concluded that for reasonable values of risk aversion and correlation between farmers and area yields, the subsidy required under the homogeneous area approach was lesser than under the individual yield approach.\(^\text{113}\)

Iyengar (1989) conducted a study on economic analysis of crop insurance for paddy in Bangalore district. The study revealed a promising sign about the viability of the programme in Karnataka and it was indicated that there was a lack of supervision by the bank officials after disbursement of loan.\(^\text{114}\)

Khonarkar (1995) conducted a study on an economic analysis of crop insurance in Nagpur district. It was found that farmers have been definitely benefited by the crop insurance scheme. It was suggested that there is need to extend the scheme to non-borrowers in addition to beneficiaries availing crop loans, so as to safeguard the interest of large farming community.\(^\text{115}\)

Tomes, Joseph et al (1999) conducted a study on an evaluation of the insurance scheme for rubber plantation in the context of natural damage and they found that the need for insurance scheme for the rubber plantations arises mainly from the estimated magnitude at the natural damage and the resultant minority loss.\(^\text{116}\)

Niranjan Lal et al (2000) conducted a study on farmers’ awareness about the crop insurance schemes. It was indicated that most of the farmers got information about

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the insurance schemes from the insurance agents but only a few farmers had adopted the crop insurance policy.\textsuperscript{117}