Status and Determinants of Crop Insurance Demand: A Study of Telangana

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By

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June 2021

Dedicated
to
My Beloved Parents, Teachers and Farmers

School of Economics
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DECLARATION

I, Pandaraiah Gouraram, hereby declare that this thesis entitled "**Status and Determinants of Crop Insurance Demand: A Study of Telangana**" submitted by me under the guidance and supervision of Prof. Phanindra Goyari and Prof. S. Raja Sethu Durai, School of Economics, University of Hyderabad, is a *bonafide* research work, which is also free from plagiarism. I also declare that it has not been submitted previously in part or full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodganga/INFLIBNET.

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A. Publication

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List of Abbreviations

AAGR	Average Annual Growth Rate
AICIL	Agriculture Insurance Company of India Limited
APR	Actuarial Premium Rate
ARG	Automatic Rain Gauge
AWS	Automatic Weather Stations
AY	Actual Yield
CAGR	Compound Annual Growth Rate
CB	Commercial Banks
CCEs	Crop Cutting Experiments
CCIS	Comprehensive Crop Insurance Scheme
CPIS	Coconut Palm Insurance Scheme
CR	Current Ratio
CRF	Calamity Relief Fund
CSC	Common Service Center
CSO	Central Statistical Office
CV	Coefficient of Variation
DAC&FW	Department of Agriculture, Cooperation and Farmers' Welfare
DBT	Direct Benefit Transfer
DCCBs	District Central Cooperative Banks
DLMC	District Level Monitoring Committee
ECIS	Experimental Crop Insurance Scheme
EML	Extensible Markup Language
ESI	Expected Sum Insured
FCIP	Federal Crop Insurance Programme
FIAS	First Individual Approach Scheme
GCA	Gross Cropped Area
GIC	General Insurance Company
GIS	Geographic Information System
GOI	Government of India

GPS	Global Positioning System
GR	Growth Rate
Ha	Hectares
IA	Implementing Agency
IASRI	Indian Agricultural Statistical Research Institute
IMD	Indian Meteorological Department
IRDA	Insurance Regulatory and Development Authority
ISRO	Indian Space Research Organization
IT	Information Technology
IU	Insurance Unit
KA	Kharif Area
KCC	Kisan Credit Cards
KS	Kharif Season
LC	Loss Cost
LPC	Land Possession Certificate
MIS	Management Information System
MNAIS	Modified National Agriculture Insurance Scheme
MNCFC	Mahalanobis National Crop Forecast Centre
MoA	Ministry of Agriculture
MOA&FW	Ministry of Agriculture and Farmers Welfare
MPCI	Multi-Peril Crop Insurance Scheme
NABARD	National Bank for Agriculture and Rural Development
NAIS	National Agricultural Insurance Scheme
NCIP	National Crop Insurance Programme
NFA	Notified Area
NLMC	National Level Monitoring Committee
NRSC	National Remote Sensing Centre
NSSO	National Sample Survey Organization
PACS	Primary Agriculture Cooperative Societies
PCIS	Pilot Crop Insurance Scheme
PMFBY	Prime Minister Fasal Bhima Yojana

PRIs	Panchayati Raj Institutions
PSSCI	Pilot Scheme on Seed Crop Insurance
RA	Rabi Area
RBI	Reserve Bank of India
RRBs	Regional Rural Banks
RS	Rabi Season
RST	Remote Sensing Technology
RTGS	Real Time Gross Settlement
SAO	Seasonal Agricultural Operations
SLCCCI	State Level Coordination Committee on Crop Insurance
TA	Total Area
TAC	Technical Advisory Committee
TSU	Technical Support Unit
TY	Threshold Yield
UAP	United Andhra Pradesh or Undivided Andhra Pradesh
USSD	Unstructured Supplementary Service Data
UT	Union Territory
UTR	Unique Transaction Reference
WBCIS	Weather Based Crop Insurance Scheme

Status and Determinants of Crop Insurance Demand: A Study of Telangana

Abstract

The broad objective of this PhD thesis is to examine the performance, development, and determinants of crop insurance programmes in Telangana including united Andhra Pradesh. Specific objectives are: (i) to analyze the performance and development of the National Agriculture Insurance Scheme (NAIS) in India in general and united Andhra Pradesh in particular, (ii) to evaluate the determinants of farmers' participation in crop insurance of major districts in united Andhra Pradesh in comparison to major states in India, (iii) to examine the farmers' perception, awareness levels and determinants of farmers' awareness of crop insurance schemes in selected sample villages of Nalgonda district of united Andhra Pradesh and (iv) to examine the factors influencing the demand for crop insurance products in selected sample villages of Nalgonda district. The study has used both secondary and primary data. Primary data sets at the household levels were collected from two sample villages (Chelmareddygudem representing the irrigated ecosystem and Yellareddygudem representing the rainfed ecosystem from Nalgonda district) in united Andhra Pradesh using the structured survey form.

The study has found that there has not been any tremendous growth in the number of farmers and the total area covered in the NAIS both in India and united Andhra Pradesh over time. However, the absolute number of farmers and area covered by NAIS in India had been increasing over time till 2013, with higher proportion during kharif season than rabi season. In all years during 2000-01 to 2012-13, the absolute area protected by the NAIS in united Andhra Pradesh also has been lower in rabi than in kharif season. The probit model estimation results showed that in undivided Andhra Pradesh, area insured and sum insured are found to be positively and significantly affecting the number of farmer's participation in NAIS for paddy crop in both rabi and khari seasons. Findings from the primary data showed that, the awareness level of farmers on the crop insurance was very low in the sample villages. About 75% of farmers in study villages were unaware of crop insurance. Majority of farmers in both ecosystems do not know about crops and the risks covered in crop insurance products and premium subsidies provided by governments. Econometric estimations on primary data showed that farmers' awareness and farmer's understanding of crop insurance are found to be positively associated with the demand for crop insurance. The educational level is low in the sample region. But farmers' educational level has been observed to be positively affecting their willingness to ensure their crops. Findings have important policy implications to policy makers in crop insurance and sustainable agriculture development.

Keywords: Crop insurance demand, Farmer's participation, NAIS, Farmer's awareness, Risk and uncertainty in agriculture, Random effects model, Probit model, Telangana.
JEL Classifications: B23, D81, D83, G22, P17, Q00, Q11.

Chapter - 1
Introduction

1.1 Introduction

Although India is stepping forward towards digitalization, agriculture remains the backbone of its economy. At the time of the First World War, the sector's share was about two thirds of the national income, which indicates the reluctance of industrialization as well as less priority to infrastructure development and high dependence on the agriculture sector. Following the implementation of planning in India, the share of agriculture has gradually decreased, and the expansion of secondary and tertiary sectors has become a priority (Dixon et al., 2001). The contribution of agriculture to national income is frequently taken as a pointer of economic growth. Generally, developed countries are less dependent on agriculture as compared to developing economies where the share is about 2 to 3 percent of GDP, which can be evident in the USA and UK (Bosworth et al., 2007). According to the Economic Survey of India (2015), agriculture and allied events' contribution to GDP (at 2004-05 prices) at factor cost decreased from 53.10 percent in 1950-51 to 29.60 percent in 1990-91 and is now at 13.90 percent in 2012-13. Thus, the shreds of evidence suggest the Indian economy has depended more on agriculture for years (Economic Survey of India, 2014).

Further, the agriculture sector is a major work providing sector in India. In 1950-51, 69.50 percent of the population was involved in agriculture. This proportion was chopped down to 66.9 percent in 1990-91 and 56.70 percent in 2001. Agriculture employed 46 percent of male employees and 65 percent of female workers between 2008 and 2011. With a massive increase in the population, the total number of people engaged in agriculture has increased to an unprecedented level. Other sectors of the economy have failed to provide adequate employment for the increasing working population, forcing them to return to farming, even though their marginal productivity on land is zero or close to zero. This produces the common underemployment problem and disguised unemployment (Venkatesh et al., 2015).

Though agriculture is a significant sector in the Indian economy, one of the important features that distinguishes agriculture from other sectors of the economy is concerned with the role played by nature in production in different sectors. Nature's whims have a significant impact on

agricultural production in an economy. Rain, floods, drought, diseases, etc. all affect and afflict agricultural production. The input-output relations are unpredictable. The biological nature of agriculture is mainly responsible for this uncertainty.

The agriculture sector is competitive and volatile. Farmers face risks of price fluctuation, yield loss, and loss of properties, making their returns highly unbalanced each year. Often, farmers are affected by the risks of disease or disasters. Natural disasters, including hurricanes, earthquakes, floods, fire, and drought, can damage livestock and crops, causing economic loss. The farmer and/or his family may be unwittingly responsible for accidental injuries, sickness, and/or deaths. The types and frequency of risks farmers face are based on the farming system and the weather, as well as policies and structured guidance. Regardless, agricultural threats are present in most parts of the world. They are burdensome for all farmers in developed countries, regardless of farm size, but especially for small-scale peasants and communities. In such situations, crop insurance becomes useful to farmers. Hence, a study on the crop insurance for an agricultural dominant state of Telangana in India assumes importance.

1.2 Risk and Uncertainty in Indian Agriculture

The agricultural sector of the Indian economy has been distressed by two risks, such as controllable and uncontrollable risks and uncertainty. Controllable risks are those that farmers can control, such as crop diseases, seeds, weeds, pests, and improper pesticide and fertilizer supply. Uncontrollable risks include a lack of sufficient rain, a lack of rainfall, severe temperatures, hail storms, high wind speeds, water and fog, and so on. Technology, effective monitoring, and the use of modern inputs can help to reduce risk in agriculture. The problem of uncontrollable threats is risk mitigation. Unlike industry, production relationships are not exact in agriculture because farmers do not have perfect control of all the environmental factors which influence crop and livestock yields. Therefore, it is impossible to predict the outcome of any productive process exactly in agriculture; there is always some chance of variation and, therefore, some uncertainty about the precise outcome of a particular productive activity over a particular period. The biological nature of agriculture is mainly responsible for this uncertainty.

1.2.1 Meaning of the term "Risk"

Risk refers to uncertainty or outcomes that are empirically or quantitatively observable. The outcome for each particular item need not be predictable. It is only necessary that the probability of outcome or less can be established for a large number of cases or observations. Risk is therefore characterized as a situation that exists when a given degree of probability can be expected for the future. Risk is a probabilistic phenomenon where outcomes are unknown and can be predicted in an only probabilistic sense (Schaffnit et al., 2010).

1.2.2 Meaning of the term "Uncertainty"

Uncertainty, on the other hand, refers to those events, to the occurrence of which probability values can be attached. Uncertainty always arises when knowledge of the future is less than perfect in the sense that the parameters of the probability distribution cannot be determined. One can, at least, guess a range within which uncertainty can materialize.

1.3 Types of Risks Involved in Agriculture

When a producer commits his resources to production in the present and then waits for the outcome until sometime in the future, two major types of uncertainty arise. This type of waiting is inherent in agriculture. These yield uncertainty, uncertainty as regards the prices of the final products. Likewise, other important types of uncertainty in agriculture are tenure uncertainty and uncertainty in the case of prices and quality of inputs (Girdžiūtė, 2012).

1.3.1 Yield Uncertainty

The main reason for this type of uncertainty in agriculture lies in the biological nature of the agriculture industry. This makes the yield much more dependent on natural factors in comparison with the products of non-farming industries. Floods, droughts, epidemics, and other natural disasters have a sudden and, at times, multiple impacts on agricultural yield. While livestock husbandry is less weather dependent than crop farming, high temperatures during the summer season can still have a significant impact on livestock production. Moreover, the possibility of a live-stock epidemic is always there (Schaffnit et al., 2010).

The extent of yield fluctuation is likely to be greater in some regions as compared to others. For example, tropical regions are more prone to yield uncertainty than temperate areas. Moreover, the yield of some crops such as cotton is more variable than that of others, like wheat. Yield uncertainty is also termed as technical uncertainty, as it refers to the variability in the production-coefficient of a given technique.

1.3.2 Price Uncertainty

Besides yield or technological uncertainty, there is also uncertainty about the prices of agricultural products. Price is more or less an unpredictable or exogenous factor for the individual farmer. The farmer operates in a market system that is similar to perfect competition, and therefore, the price he receives for a product of a given value is completely unaffected by any policy or course of action that he may undertake. He is a price-taker, not a price-maker. The external factors affecting prices are the other farmers' behavior taken as a whole, weather induced random variations in output, variations in national income and prospects, as well as irregular cob-web production cycles.

The product prices faced by the non-farm industries are also subject to fluctuations, but the degree of price uncertainty in this industry is much less than in agriculture. The primary reason for this is that non-farm industries are not only less affected by weather-related price fluctuations, but also because the monopolistic market structure in which they operate allows them to exercise generator control over the prices of their products. In the case of manufacturing, price fluctuations are likely to be further reduced because, compared to agriculture, it is easier to adjust the supply of its goods to changes in demand (Schaffnit et al., 2010).

1.3.3 Tenure Uncertainty

The uncertainty of tenure is another form of uncertainty in farming. In general, we know that land is leased to tenants. The tenants are concerned that he will be unable to get the land for an extended period of time. He will, therefore, hesitate to make long-term improvements in the land as he is not sure about earning sufficient additional returns from such improvement during the period of the tenancy.

1.3.4 Financial and Credit Risk

Farmers must plan to make investments that they will only be able to recover once the commodity is marketed, as there are various types of agricultural production provided over long periods of time. This may cause difficulties in moving capital, which is compounded by a lack of access to insurance, credit, and high debt costs. It also creates a liability for reimbursement. Growing interest charges, credit existence view called by creditors, and controlled recognition of acquiring the grower's ability leads to credit and financial risks.

1.3.5 Institutional Risk

An institutional risk is a major source of uncertainty for agriculturalists, caused by unanticipated changes in legislation that impact growers' behavior. Changes in policies, monetary services, market levels, revenue provision payments, and aid may all have a significant impact on the performance of agricultural events.

1.3.6 Human or Personal Risk

Additional risk-taking denotes factors such as human well-being issues or personal relationships that can interrupt cultivation. Farming families, like any other financial businessperson, face individual risks affecting the lives and health of those who work in the farmhouse, as well as risks from floods, cyclones, and droughts, as well as possible damage or theft of manufacturing equipment and other agricultural properties.

As indicated above, agriculture risk is mainly caused by the possibility of adverse effects such as weather instability, crop failure due to disease and pests, difficulties in planning harvesting operations, and market volatility and unforeseen changes in global and local trade policies. These aforementioned circumstances result in agricultural activities being disrupted and harmed. Efficient risk management techniques are required to determine the likelihood of such unfavorable circumstances occurring and to mitigate their consequences. Appropriate understanding of crop insurance policies is thus critical for risk management in agriculture.

1.4 Management of Risk and Uncertainty in Agriculture

Risk and uncertainty management suggests minimization of revenue loss either by falling disparities in production or safeguarding the lowest price or assuring a sure amount of revenue. In agriculture, this is known as a procedure for assessing and reducing risk. The methods planned to do so are denoted as risk administration substitutes. These are debated under the succeeding sections.

- *Evading risk and uncertainty:* More or less of the manufacturing risks can be evaded. For example, removing additional risky initiatives would reduce risk but at the expense of reduced overall production or returns. Dawdlers continuously attempt to evade risk and uncertainty. They choose for guaranteed though low revenue initiatives (Schaffnit et al., 2010).
- *Preventing risk:* Some threats can be avoided several times by enticing advance action. For example, subsequent preventive pest control could eliminate the threat of pest-related damage in agricultural production. The cost of this replacement risk management is the cost of preventative pest control (Schaffnit et al., 2010).
- *Sharing risk:* The risk of sharing which is fairly mutual and as an alternative to India's risk management strategy. The main risk distribution instance is shared land leases with tenants. The risks of farming production are shared between the landlord and the occupant in the proportion of inputs and production that they share. The cost of this landlord substitute would be the same as the difference between the occupant's net income receiving rent and being compensated for rent payment lease.
- *Transferring of risk:* The risk of moving from one farmer to another or group. In promoting agreement, for instance, marketing burden may be passed to customers. This guarantee is to pay for the plant to be known in the future at an accepted value. This cost is the difference in the value of the produce between the price negotiated and the post-harvest or market price. One example of shifting manufacturing threat to another system is crop insurance. In the event that crop projections are lower than the minimum assured, proportional insurance is paid for the spending incurred. This alternate price is referred to as a premium which is paid by the growers.
- *Spreading of risk:* One risk management strategy can be spread across multiple initiatives to change the level of risk and, obviously, to change the amount of net income. This is

recognized as a change. Modification might be with diversified farming practices, segregated agriculture or even mixed crop cultivation. It will ensure that some revenue from undertakings/crops is realized even in adverse climatic conditions, for example. The price of this substitution would be the difference between the two because net earnings from the combination of different enterprises/crops would be less than net earnings from the highest-paid crop (Lipinska, 2015).

- *Risk-taking:* Farmers' risk-taking capacity could also be a substitute for risk when the administration price is zero, as no effort is made to lower the risk in agriculture. The knowledge is to prepare for maximum earnings even though there is a high risk involved. The two groups of people who are always eager to take the chance are innovators and early adopters. These are exciting for high-risk, high-reward projects.

Agriculture risks are both manageable and unmanageable. Pests, viruses, weeds, crops, and defective fertilizers or pesticides are all controllable threats. Uncontrollable threats include rainfall deficits or excesses, rainfall distribution, severe temperatures, hail storms, wind speeds, humidity, and fog, among others. Controllable risk is mitigated by technology, efficient monitoring, and input use. The difficulty is mitigating uncontrollable threats. Numerous risk-reduction techniques are applicable in Indian agriculture, including Intercropping, Crop Diversification, Self-Insurance, Labour Markets, Credit, Tenancy Control, and Crop Insurance (Singh, 2018).

The primary goal of insurance schemes is to protect risk-averse people from being affected by natural probabilistic events (Singh, 2018). Regardless of how risk is distributed among individuals, the insurance market's philosophy is based on large numbers. Insurance encourages people to engage in risky behaviors they would not have done otherwise by providing the option of risk shifting (Ahsan et al., 1982). Individuals have no say whether or not a dangerous accident occurs. The insurance agent has fairly reliable yet aggregated information on the insured. However, in the case of agriculture or crop insurance, this is not the case. Crop risk is not distributed uniformly or separately among the insured, unlike most other forms of insurance. Weather conditions, whether favorable or unfavorable, may have a significant impact on a

region's entire population. As a result, crop insurance is extremely important for a former farmer (Singh, 2018).

1.5 Insurance Theory in General

Generally speaking, the term insurance is defined as a promise to reimburse potential future victims. Insurance provides financial protection during a disaster through the sense of compensating for damages. Various insurance providers sell a diverse range of insurance products, and an insurance buyer should choose the one that is most convenient for them and meets their personal expectations. The insurance providers provide comprehensive coverage at affordable rates. Premiums are periodic payments, and providers offer a range of premium payment options. The periodic insurance premiums are determined by the cumulative amount insured. Insurance is a financial system in which losses incurred by a few are compensated from funds accrued by several people exposed to similar risks.

An official insurance definition which tends to be the following in many insurance rules is: An insurance agreement is that where a party, the insurer, undertakes to make a payment to another party, the policyholder or a third party for a premium or valuation, if there is an incident involving a risk (Harrington and Niehaus, 2003). The necessary requirement for insurance policies is the existence of a vast number of equivalent incidents of failure. What makes insurance feasible, according to the theory of probability, is the aggregation of many loss events, homogeneous and separate, into categories. Even if the likelihood of an incident occurring is accurately identified, data does not apply to an individual's experience or even a small cluster.

One reason insurance company can issue insurance agreements to individuals who are unable to differentiate themselves from the risks is the merging of loss experiences and decreasing the risk of variation from the anticipated result. An additional reason is that by incorporating many business classes into a portfolio, the insurance company can diversify the residual risk of each failure contact group. An insurance company is unable to have all their eggs in the basket. The occurrence of a hazard must be unintentional to be insurable. It is only likely to insure against risks that are certain to occur when there is uncertainty about the incidence judgment or the amount of potential damage (Velandia et al., 2009)

1.6 Agricultural Insurance Theory

Insurance is a measure of risk control intended to cover the possible failure of a product or service. The conventional term is a fair and just transfer of risk in return for a premium, or a promise of a small loss to prevent a much larger loss. Agricultural insurance helps peasants offset the expenses of their farmland. Recognizing the specialized nature of insurance, insurance companies have dedicated agribusiness units to underwriting the risk, or outsource the underwriting to specialized firms. Agricultural coverage should include all areas of the agriculture industry, including crop insurance, animal breeding, natural resources, forestry, aquaculture and greenhouses (Iturrioz, 2009).

1.7 Crop Insurance

1.7.1 What is Crop Insurance?

Based on the reports of the "*Agricultural Insurance Company of India Limited*", the definition is given as, "crop insurance is characterized as a means of protecting farmers against financial losses stemming from uncertainties and risks like unforeseen natural disasters. Crop protection is perceived to be an important tool for keeping up stability in farm income, through systematic innovation, authorizing speculation, and expanding credit stream in the agricultural sector. The crop protection made at the state level is anticipated to give compensation in the event of harm because of regular disasters".

According to (FAO, 1992), "Crop insurance provides protection against loss or damage to growing crops, including perennial crops such as tree crops against specified or multiple perils, e.g., hail, windstorm, fire, flood. Measurement of loss could be by yield basis, production costs basis, agreed value basis or rehabilitation costs basis. While most crop insurance is geared towards loss of physical production or yield, cover may also be provided for loss of productive assets such as tree crops".

The World Bank (2010) defines crop insurance as "financial compensation for production or revenue losses caused by specified or multiple perils, such as hail, windstorm, fire, or flood.

Most crop insurance pays for the loss of physical production or yield. Coverage is also often available for loss of productive assets, such as trees in the case of fruit crops".

1.7.2 Crop Insurance in India: A Historical Perspective

Background and Early Attempts at Crop Insurance

Risk management in agriculture originated in India during the twentieth century as a practice concerned with crop insurance. It has evolved periodically but consistently over the century, from definition to assessment, and it is still evolving in terms of access, methodologies, and designs. India is a farming nation, with agriculture providing a living for the majority of the population. Despite this, crop production in India is heavily dependent on weather, which can be severely harmed by sudden weather changes as well as blighter and disease attacks. These erratic and docile orthogonal threats are putting India's agricultural efforts at risk. Crop insurance plays a pivotal role in anchoring the sphere's maturation (Dandekar, 1976).

1.7.3 Before Independence

Shri J. S. Chakravarthy of Mysore State had planned a rain insurance scheme for farmers in the pre-independence period in 1915, with the hope of protecting them from drought. His system is based on what is referred to as the area methodology at the moment. He published several papers in the Mysore Economic Journal explaining the idea of Rainfall Insurance. Shri Chakravarthy published "Agricultural Insurance: A Practical Scheme for Indian Conditions" in 1920. Apart from that, some royal states such as Madras, Dewas, and Baroda attempted, but failed, to provide harvest defense assistance through various systems.

1.7.4 After Independence

Following the declaration of independence in 1947, harvest security started to be defined more frequently. In 1947, the Central Legislature conducted a study on the subject, and the then Food and Agriculture Minister, Dr. Rajendra Prasad, announced that the administration would examine the probability of harvest and livestock safety, and a unique study was created in 1947-48 for this purpose. The primary consideration in terms of consumer protection modalities was whether an Individual Methodology or a Homogenous Zone Strategy should be identical. Despite previous

attempts to compensate the farmer for the full extent of his misfortunes, the rancher agrees to the premium to be charged for his previous yield and misfortune experience.

The term 'farm methodology' refers to the compilation of robust and reliable data on the harvest yields of individual ranchers over a sufficiently long period of time to provide an actuarially sound basis for premium calculation. The 'homogeneous area' methodology is proposed in the absence of accurate information from individual ranchers and in light of the ethical risks associated with the 'individual approach.' As a result, the homogeneous territory is comprised of areas that are homogeneous in terms of harvest. According to the study, a 'homogenous region' policy is used for all the areas, in which distinct agro-climatically homogeneous regions are treated as a single body, with individual farmers paying the same premium and receiving the same benefits regardless of their fortunes. On the other hand, the Ministry of Agriculture declined to consider the state governments' proposal for appropriation. The Indian government introduced a Crop Insurance Bill and a Crop Insurance Model Scheme in October 1965, with the ultimate goal of encouraging states to provide yield insurance if they so desired. In 1970, the Expert Committee of Dr. Dharam Narain referred to the draft Bill and Model Scheme. Along these lines, the subject of crop insurance has been debated and investigated for more than two decades (Dandekar, 1985).

Professor V. M. Dandekar, recently dubbed as the "Father of Crop Insurance in India," recommended another "Homogenous Area Approach" for harvest safety in the mid-1970s. In India, crop insurance began with the creation of the Comprehensive Crop Insurance Scheme for All Risks (CCIS), which guaranteed actual harvests. This program began in 1985. This presentation timeframe is also consistent with the launch of the Seventh-Five-Year Plan. This advertising policy was later superseded and extended by the National Agricultural Insurance Scheme (NAIS). This substitution has been active since 1999.

Throughout the history of yield safety, schemes have been proposed on a pilot basis after years of preparation, tests, plans, inquiries, and trials. Not long after Indian autonomy in the yield protection history, the issue of presenting a harvest protection plan was considered. The primary vantage point examined was that of substance safety modalities. The issue at hand expressed the

truth about whether yield security should be provided using a unique technique or a uniform approach across the territory (Singh, 2010). The plan's unique solution compensates the rancher in full for his misfortunes. Indeed, the premium he pays is determined by his precise historical yield and experience of misfortune. The methodology for these plans requires reliable and accurate data on individual ranchers' harvest yields over an extended period of time in order to calculate premiums on actuarially sound assumptions. The homogenous zone approach was then used to visualize a homogeneous area from the perspective of harvest generation and the proximity of annual variability in yield creation. The homogeneous area solution was determined to be more appropriate. This is because it would encourage the procurement of a single unit of treatment for diverse agro-climatically homogeneous ranges and individual ranchers, allowing them to pay the same premium and receive the same benefits regardless of their financial circumstances (Nair, 2010).

1.7.5 First Individual Approach Scheme (FIAS), 1972-1978

From 1972-73, different types of experiments were begun on small, ad hoc and dispersive scales with a crop insurance scheme for cotton H-4. Subsequently, the scheme included the crops groundnut, wheat and potato. The states of Gujarat, Karnataka, Andhra Pradesh, Maharashtra, West Bengal, and Tamil Nadu were among the states to adopt the system (Operational Guidelines of FIAS, 1972). It existed until 1978-79, and only 3,110 farmers were covered by a premium of Rs 4.54 lakhs against claims totaling Rs 37.88 lakhs. The claim premium ratio was 8.34, which means that for every rupee of premium received, the scheme paid out Rs 8.34 in claims. The very high claim premium ratio made these schemes uneconomical and unsuitable for implementation on a large scale as per GIC of India (Raju and Chand, 2009).

1.7.6 Pilot Crop Insurance Scheme (PCIS), 1979-1984

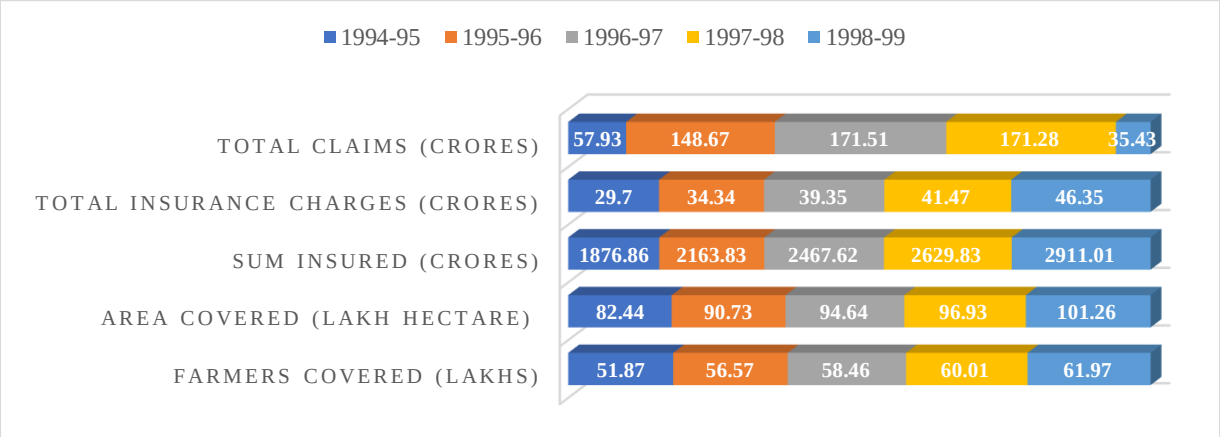
In light of the above experimental scheme's history and experience, the GIC of India commissioned a study and entrusted it to Prof. V. M. Dandekar to recommend a suitable method to be used in the scheme. The study's recommendations were adopted, and the GIC launched a PCIS in 1979 based on the "Area Approach" for providing insurance cover against a crop yield deficit below the threshold mark. The scheme was limited to loanee farmers from institutional sources on a voluntary basis. This included crops of chickpea, potato, cotton, oilseeds, millets,

and cereals (Operational Guidelines of PCIS, 1979). The premium charged was divided in a 2:1 ratio between the GIC and the state governments. The maximum amount insured was initially 100 percent of the crop loan, but this was later raised to 150 percent. The insurance premium ranged from 5 percent to 10 percent of the insured amount. Premium charges paid by small and marginal farmers are subsidized by 50 percent, with the funds split evenly between the state and federal governments. PCIS 1979 was introduced in 12 states until 1984-85, covering 6.23 lakh farmers for a premium of Rs 195.01 lakh against claims of Rs 155.68 lakh. The following are some of the flaws that hampered the crop insurance scheme's coverage (Raju and Chand, 2009).

1.7.7 Comprehensive Crop Insurance Scheme (CCIS), 1985-99

The "Comprehensive Crop Insurance Scheme (CCIS)" was announced by the Indian Administration with dynamic State Governments involvement with effect from 1 April 1985. The program had to do with small-term crop credit and was employed in the homogeneous area approach. Nevertheless, the system was not mandatory for all countries. Until the crop season Kharif 1999, the program was used in 15 states and two capital territories. Among them, Pondicherry and Andaman & Nicobar Islands are the Union Territories and Assam, Andhra Pradesh, Bihar, Gujarat, Goa, Karnataka, Himachal Pradesh, Kerala, Maharashtra, Madhya Pradesh, Meghalaya, Tamilnadu, Orissa, Western Bengal, and Tripura are the states. The plan was initially merged by the states of Rajasthan, Uttar Pradesh, Jammu and Kashmir, Manipur, and Delhi, but it was later abandoned after a few years. This scheme's distinguishing characteristics are as follows: Farmers must obtain crop credit from financial institutions in order to improve land nutrition, harvests, and so on. Each penny of harvest advance was limited to 100, with a cap of Rs.10,000/-per farmer. Premium values for grains and millets are 2 percent, and pulses and oilseeds are 1 percent. Premium bids from farmers were solicited during the advance payment season. A substantial portion of the fee charged by tiny and insignificant ranchers was funded similarly to how the federal and state governments do (Tripathi, 1987). The central and state governments weighted Premium and Claims at a 2:1 ratio. The proposal included several offices, including the GOI, the economy, banking, and GIC (Operational Guidelines CCIS, 1985).

Figure 1.1: Performance of Comprehensive Crop Insurance Scheme, India (1994-95 to 1998-99)



Source: The Ministry of Agriculture, Government of India.

The establishment of a comprehensive crop insurance scheme in India from 1994-1995 to 1998-1999 is depicted in Figure 1.1. The scheme's insurance coverage has been raised from 51.87 lakh farmers in 1994-95 to 61.97 lakh farmers in 1998-99. The number of farmers covered between 1994-1995 and 1995-1996 carrying 5.30 lakh is greater than the number covered during the other three cycles of 1995-1996, 1996-1997, and 1997-1998. The scheme's coverage area increased from 82.44 lakh hectors in 1994-95 to 101.26 lakh hectors in 1998-99. Similarly, the amount assured has increased from Rs. 1876.86 crores in 1994-95 to Rs. 2911.01 crores in 1998-99, while insurance charges have increased from 29.7 crores in 1994-95 to 46.35 crores in 1998-99, a difference of 6.35 crores in five years. In terms of claims, the fact that the claim value increased from 57.93 crores in 1994-95 to 148.67 crores, 171.51 crores in 1995-96 and 1996-97 consecutively, while the claim value decreased from 171.21 crores in 1997-98 to 35.43 crores in 1998-98 is noteworthy. Additionally, the CAGR and AAGR are both positive, with the exception of claiming. Thus, according to this table, the number of farmers insured, the insured region in hectors, and the insurance charges had increased by 1998-1999, despite a significant decrease in claim value (Operational Guidelines CCIS, 1985).

1.7.8 Experimental Crop Insurance Scheme (ECIS), 1997-98

During the Rabi season of 1997-98, the Experimental Crop Insurance Program was proposed to cover small and marginal farmers who do not have access to institutional financing. This strategy has been implemented in 14 states. The Scheme included a complete endowment of the

premium. The premium and claim amounts were divided in a 4:1 ratio by the federal and state governments. The scheme secured 4.55 lakh farmers against a premium of Rs. 2.84 crores for an insured amount of Rs. 168.11 crores, with Rs. 37.80 crores paid in claims (Operational Guidelines of ECIS, 1997).

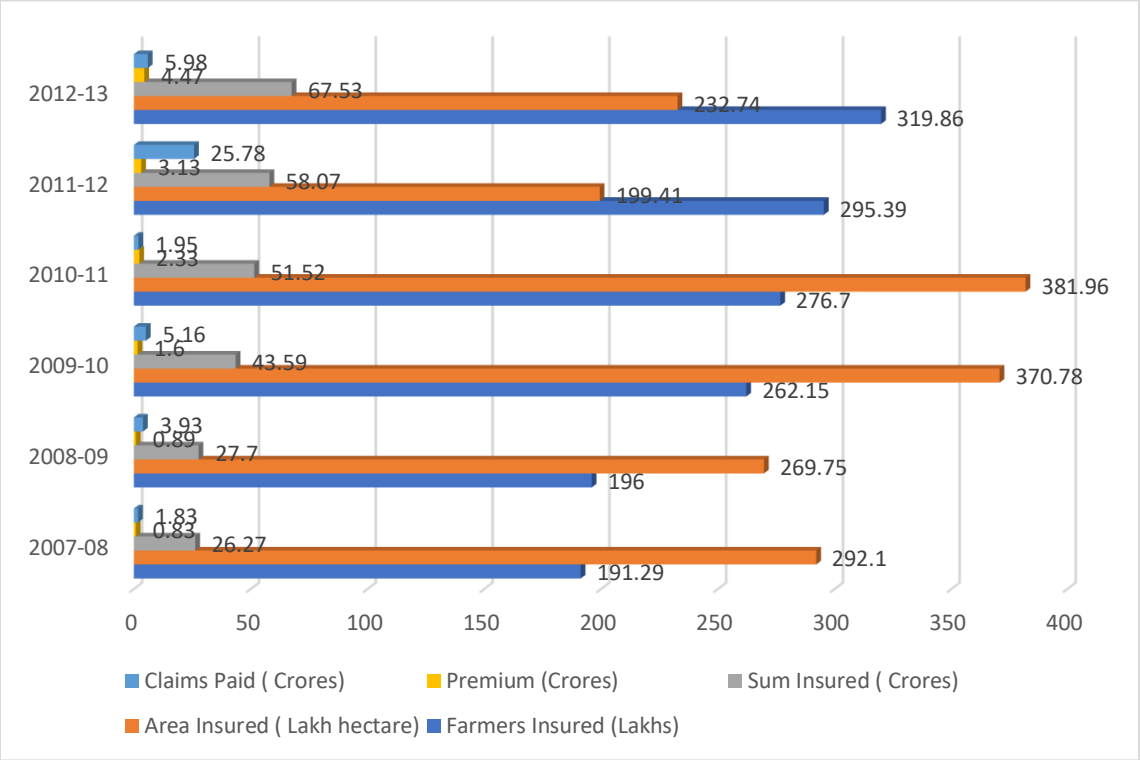
1.7.9 National Agriculture Insurance Scheme (NAIS), 1999-00

Since Rabi 1999-2000, India's improved crop insurance program, called the National Agricultural Insurance Scheme, has been implemented. The Union Budget 2002-03 proposed the establishment of the Agricultural Insurance Corporation (AIC) with the participation of the "General Insurance Corporation of India (GIC)", four general insurance companies in the public sector, namely National Insurance Company Limited, New India insurance company Ltd., Eastern insurance company Ltd., and United Co. Insurance Ltd., in collaboration with NABARD. The promoter's subscription to the paid-up capital will be GIC's 35 percent, NABARD's 30 percent and the four general insurance companies' 8.75 percent each. The new organization's approved capital will be Rs.1500 Crores, while Rs.200 Crores will be the initial paid-up capital. The "National Agricultural Insurance Scheme (NAIS)" is transferred to the new organization and is, to begin with, the center of the company. There will be a transition to the actuarial regime over a period of time. The new organization, together with crop insurance, will cover other related rural/agricultural risks in due time. The program's basic objectives are to provide farmers with insurance coverage and financial assistance in the event that any of the notified crops fails due to natural disasters, pests, or diseases, and to allow farmers to practice modern agriculture through the use of high-value inputs and improved agricultural technology (Operational Guidelines of NAIS, 1999).

1.7.10 Pilot Scheme on Seed Crop Insurance (PSSCI)

The Seed Crop Insurance Programme was announced on a trial basis between 1999-2000 and 2000-01, with budget funds given to identified states which including "Andhra Pradesh, Orissa, Gujarat, Haryana, Karnataka, Madhya Pradesh, Punjab, Rajasthan, U.P, Maharashtra" to use the scheme (Operational Guidelines of PSSCI, 1999).

Table 1.2: Increasing Development of National Crop Insurance Programme (NCIP) in India (2007-08 to 2012-13) in lakhs.



Source: Ministry of Agriculture, Govt. of India.

1.7.11 National Crop Insurance Programme

Agricultural insurance in India is covered under the "National Crop Insurance Program" announced in 2013 by the UPA government through the integration of three schemes. "Modified National Insurance Scheme for Agriculture (MNAIS), Weather Based Crop Insurance Scheme (WBCIS) and Coconut Palm Insurance Scheme (CPIS)". All three structures are now serving as NCIP mechanisms. In the modernized scheme of the National Crop Insurance Program (NCIP), the insurance unit area was declined to village/panchayat level.

The aims of the scheme are to provide economic insurance for farmers in their crop production to help maintain the flow of farming credit, to encourage farmers to embrace liberal agricultural output and advanced farming technology, thus helping to maintain growth, jobs and economic development (Operational Guidelines MNAIS, 2011).

1.7.12 Modified National Agriculture Insurance Scheme (MNAIS)

The "Modified National Agriculture Insurance Scheme" is working as a part of the National Crop Insurance Programme (NCIP). This structure protects farmers financially and offers insurance coverage in the event of crop failure and resulting low crop yield. This scheme has been realized in all identified 50 districts from all over India including different sates/union territories from the 2010-2011 Rabi crop season.

The state administration notifies which specific crops have to be protected for a specific season or year. Thus, it does not cover all crops but only those crops belonging to the above three comprehensive groups, which have been notified by the state government level. The state government notifies those crops for which the historical yield statistics are accessible for a sufficient number of years (Operational Guidelines MNAIS, 2011).

1.7.13 Crop Insurance in Telangana and United Andhra Pradesh

Since the inception of crop insurance arrangements in India, the state of Telangana, which is part of the state of United Andhra Pradesh, has participated in and implemented all crop insurance schemes. The state participated in the following schemes. They are: "First Individual Approach Scheme (FIAS) 1972-1978, Pilot Crop Insurance Scheme (PCIS) 1979-1984, Comprehensive Crop Insurance Scheme (CCIS) 1985-99, Experimental Crop Insurance Scheme (ECIS) 1997-98, National Agriculture Insurance Scheme (NAIS) 1999-2010, Pilot Scheme on Seed Crop Insurance (PSSCI) 1999-2001, National Crop Insurance Programme (1999-2010), Modified National Agriculture Insurance Scheme (MNAIS) (2010-11), and Prime Minister Fasal Bheema Yojana PMFBY (2016 to till date). The National Agricultural Insurance Scheme (NAIS) was launched in United Andhra Pradesh during Kharif 2000 with the objective of offering financial assistance to farmers in the event of crop letdown caused by natural disasters, in order to restore credit eligibility for the following season and stabilize farm incomes."

Telangana and Andhra Pradesh are the only states that have implemented the National Agriculture Insurance Scheme's "Village as Insurance Unit" in all districts of Andhra Pradesh and Telangana beginning with the Kharif 2008 season. The village-level insurance scheme

benefited farmers more because losses in a smaller region were more representative. The crops to be implemented at the village level are chosen based on the cropped area under the principal crops (Operational Guidelines of CCIS, NAIS and MNAIS).

1.8 The Research Problem and Objectives

It is difficult to research crop insurance participation and demand in India and among its states because the crop insurance industry is not a competitive market. What are the economic, social, demographic, and crop insurance awareness factors influencing crop insurance participation, awareness, and purchases by farmers in modern India? It is beneficial to understand how Indian farmers in general and Telangana farmers in particular weight various crop insurance participation, awareness, and demand attributes to decide whether they follow the conventional demand model and indicate farmers' preferences towards willingness to pay (WTP) for insurance and participation. As a result, this study used econometric models like panel regression models to examine the farmers' involvement in crop insurance and probit regression models to evaluate WTP for the crop insurance demand and awareness attributes. We also compare and contrast WTP or demand for crop insurance, farmers' participation determinants across two different ecosystems from the Telangana state (Yellareddygudem represents rainfed ecosystem and Chelmareddygudem represents irrigated ecosystem).

The Indian crop insurance industry's challenge was the low awareness, inadequate data, and lack of education etc. for the farmers, resulting in economic losses for insured farmers. Apart from that, since farmers in a given village earn the same premium rate, there was little awareness about crop insurance products and, as a result of that, less demand for crop insurance and its participation. Without widespread variation in insurance rates, determining the true insurance demand models is difficult. Therefore, how the factors like premiums, coverage, and claims determine the farmers' participation in crop insurance is addressed in this thesis. To determine the farmers' participation in the crop insurance panel, regression models are employed. Additionally, using field survey data and probit regression models, WTP or crop insurance demand and awareness determinants were analyzed. The field data provided variance in farmers' preferences, awareness of crop insurance, and crop insurance demand determinants. Further, WTP or demand for crop insurance derived from field data and farmers' participation in crop

insurance from secondary data can be used for policy recommendations for both the government and insurance companies.

Research Objectives

The broad objective of this thesis is to analyze and examine the performance, development, and determinants of crop insurance participation and demand for crop insurance programmes in Telangana State, India. This thesis aims to examine four specific objectives as given below:

- To analyze the performance and development of the National Agriculture Insurance Scheme in India in general and Telangana and United Andhra Pradesh in particular.
- To evaluate the determinants of farmers' participation in crop insurance of major districts in Telangana, United Andhra Pradesh and major states in India.
- To examine the farmers' perception, awareness levels and determinants of farmers' awareness on crop insurance schemes in selected sample villages of Telangana State.
- To examine the factors influencing the demand for crop insurance products in selected sample villages Telangana State.

The first specific objective is an attempt to analyze the performance and development of the National Agriculture Insurance Scheme in United Andhra Pradesh and India by considering the several aspects of NAIS. This objective deals with the analysis of farmers covered, the area covered, the growth rate of area and farmers covered, financial performance, changes in premium subsidies and claims of NAIS for both UAP and India. The second objective focuses on the determinants of farmers' participation in crop insurance (NAIS). The third and fourth objectives are to provide some empirical evidence on the determinants of crop insurance demand, farmers' awareness, and perception of crop insurance in the selected district of Nalgonda. These objectives also tried to find the differences between the determinants of crop insurance demand and awareness levels on crop insurance among two different ecosystems, namely irrigated ecosystem (Chelmareddygudem) and rainfed ecosystem (Yellareddygudem).

1.9 Significance of the Study

In light of the government's current emphasis on crop insurance schemes as a major approach to removing agricultural uncertainty and distress in order to achieve agriculture development, and in line with Indian national agricultural insurance policies such as NAIS, MNAIS, and the recently launched PMFBY to revitalize the agricultural sector's contribution to the national economy, this study will offer useful recommendations to enhance greater participation by farmers in crop insurance schemes. The results of this research will be useful to several groups or bodies, including farmers, insurance personnel, agricultural department personnel, and banking personnel that are directly or indirectly included in the planning, execution, implementation, participation, development, and evaluation of crop insurance schemes. Precisely, this study will be meaningful and useful to the following:

Ministry of Agriculture at the National and State Levels: This ministry is charged with the responsibility of formulating crop insurance policy, determining the premium subsidies and determining the future direction of crop insurance schemes.

Agriculture Insurance Company of India Limited: This Company is accountable for managing the overall planning and implementation of development activities of various aspects related to crop insurance activities.

*Stakeholders of the Crop Insurance Schemes***:** This group includes the different stakeholders of the crop insurance policies implemented for Indian farmers.

*Insurance Personnel***:** One of the main stakeholders of crop insurance schemes, this thesis suggests important recommendations to increase farmers' participation and awareness in crop insurance schemes at local, state and national level.

Banking Personnel: Crop insurance in India is connected to the banking sector. Crop insurance subscription is compulsory for loanee farmers. The thesis would provide certain suitable recommendations to enhance the banker’s role in promoting the crop insurance scheme.

Agriculture Personnel: They play a key role in agriculture related aspects, but their role is limited in crop insurance schemes implementation. So, studies suggest them for best implementation and success of crop insurance schemes.

1.10 Assumptions

The total conduct of this research work depends on the following assumptions, specifically:

- Homogeneity among farmers collecting data in specific sample villages or regions,
- Farmers chosen for this study received unbiased and accurate information during interviews; and that the data collection interview method was appropriate for obtaining relevant data in order to achieve the research goals of this thesis.

1.11 Data and Methodology

The study aims at analyzing the determinants of farmers' participation, awareness and demand for crop insurance in two different ecosystems selected from Nalgonda district of Telangana State. We focus on the four aspects of crop insurance issues. (i) development and growth of crop insurance in UAP and India, (ii) factors affecting the farmers' participation in crop insurance, (iii) farmers' awareness of crop insurance and its determinants, and (iv) determinants of crop insurance demand. However, for the analysis on the first two objectives, growth and development of crop insurance and factors of farmers' participation in crop insurance of the state UAP and India, we used the season-wise time series secondary data mainly the number of farmers covered, area covered under the crop insurance, sum insured, premium subsidy, gross cropped area, claims. This secondary data is collected from various sources like United Andhra Pradesh Agricultural statistics on various issues, Economic Survey of United Andhra Pradesh, AICIL Regional office, Hyderabad and the Directorate of Economics and Statistics of United Andhra Pradesh.

However, the third and fourth objectives, farmers' awareness levels and the determinants of crop insurance demand of the study have been examined by using the primary survey data between two ecosystems. This data for the analysis purpose is collected from the farmers by adopting a sampling technique. To collect these primary data, an appropriate pre-tested questionnaire or survey schedule was developed, and the survey was carried out in selected villages at the household level in two Mandals, namely Anumula and Narkatpally in the Nalgonda district, with one village from each mandal representing two different ecosystems, namely irrigated and rain

fed agriculture. In total, 430 households were taken as a sample from two villages, including 215 farmers from each village.

Two mandals were selected based on the amount of irrigation. If one region has more than 60 percent of its cultivated land getting assured irrigation, then it comes under an irrigated ecosystem and if one region has less than 60 percent of its cultivated land getting irrigation, then it is considered as rain fed agriculture. An appropriate methodology is used to analyze the determinants of crop insurance demand, farmers' participation in crop insurance and determinants of farmers' awareness of levels of crop insurance. For the analysis of factors influencing crop insurance demand and awareness, the Probit Regression Model for Factors Affecting is employed. The entire analysis is being done for both irrigated and rain fed regions separately and then for the entire study region as a whole by taking the pooled sample.

To analyze the objectives of the secondary data, the study employed simple growth rates, compound growth rates and to identify the factors influencing the farmers' participation in crop insurance, panel regression models have been employed since available data is the balanced panel.

1.12 Organization of Study

Based on the objectives mentioned above and for the convenience in the analysis of the objectives, the following chapter schemes of the proposed study have been prepared as follows:

Chapter 1 deals with the background of the study and statement of the problem. It also contains motivations, a brief review of literature and objectives. In addition, it also provides the historical background of the evolution of crop insurance schemes in India and Telangana.

Chapter 2 deals with a review of literature related to four main themes of crop insurance, which includes the reviews related to performance and development of crop insurance, determinants of farmers' perception of crop insurance, determinants of farmers' awareness of crop insurance schemes, and determinants of demand for crop insurance. Our primary goal in this chapter is to recognize research gaps in the current literature on the subject at hand and to make the case for conducting a study in the present framework.

Chapter 3 discusses the issues relating to the database definition and the methodological structure of the current study. The research is based on primary data collected through a structured questionnaire. As a result, this chapter also discusses the sampling procedures and profiles of study areas used in the current analysis. Additionally, secondary data has been gathered and used for the analysis of the first two objectives mentioned in the thesis. Therefore, secondary data sources are also discussed. Further, depending on the availability and consistency of data, the approach used in this analysis includes common statistical methods such as averages, percentages, probit and panel regression models and so on.

Chapter 4 of the thesis analyses the performance of the National Agriculture Insurance Scheme in Telangana, and India. More specifically, it analyses the NAIS performance in different aspects like financial performance, coverage performance, participation performance, and claims performance for Telangana state and India.

Chapter 5 empirically examines the determinants of farmers' participation in crop insurance schemes (NAIS) in Telangana, UAP and India. It demonstrates how different variables impact and jointly determine the farmers' participation in crop insurance for both the crop seasons in India and Telangana.

Chapter 6 deals with specific factors affecting farmers' awareness of crop insurance schemes and their awareness level and perception of crop insurance between two different ecosystems in Telangana state.

Chapter 7 deals with the meaning of crop insurance demand and its determinants in the earlier literature. It also empirically analyzes the determinants of demand for crop insurance products in the selected district of Nalgonda, Telangana, India.

Chapter 8 of thesis provides the summary and conclusion by summarizing the main findings and overall conclusions from the previous chapters. It also tries to elicit a few plausible suggestions for administrators and policy makers engaged in agricultural planning in the state, as well as those elsewhere dealing with similar issues.

1.13 Operational Concepts and Definitions of Terms

In empirical research, it is necessary to set out some of the basic and important details about the concepts and the variables and also about the methodology utilized. Subsequently, a well-developed background of research usually thrives in evading bias, limiting the scope for subjective conjectures and ambiguities, and putting things in a clear perspective. In tune with the usual practice, an attempt is made to straighten out these preliminaries so that the subsequent analysis gives itself to a proper appreciation.

"*Agriculture Insurance*: Insurance risk mitigation tool to use in agricultural enterprises, which includes crop insurance, livestock insurance, aquaculture insurance, and forestry".

"*Claim*: The request for indemnity (payment) after an insured event has happened".

"*Crop Insurance*: Provides protection against loss or damage to growing crops, including perennial crops such as tree crops against specified or multiple perils, e.g., hail, windstorm, fire, flood. Measurement of loss could be by yield basis, production costs basis, agreed value basis or rehabilitation costs basis. While most crop insurance is geared towards loss of physical production or yield, the cover may also be provided for loss of productive assets such as tree crops".

"*Guaranteed Yield*: The expected physical yield of a crop which is stated in the insurance policy against those actual yields will be compared when adjusting for any losses".

"*Hazard*: A physical or moral feature that increases the potential for a loss arising from an insured peril or that may influence the degree of damage".

"*Insurer*: The Company which issues an insurance policy and is named in the policy as being responsible for paying a claim should a loss event result in damage to the insured property".

"*Livestock Insurance*: This class of agriculture insurance generally centers on the provision of mortality cover for livestock due to named disease (s), and accidental injury. Insurance cover is normally restricted to adult animals and may be taken out on an individual animal or herd basis. Major classes of insured livestock include beef and dairy cattle, sheep, goats and pigs, and domestic fowl".

"*Moral Hazard*: The risk or danger to be looked for from human nature, both individual and collective. Moral hazard depends mainly on the character of the society, the character of the insured, and on the character of its employees and how they work and behave at work. Examples of poor moral hazards are carelessness, fraudulent claims, crime or arson, irresponsibility, gross over insurance, general moral climate due to period of depression and recession and unreasonable demand for high amount of claims settlement".

"*Peril*: A potential cause of loss or damage to the property. Perils can be insured or uninsured; both are usually named on the insurance policy. It is therefore important that loss adjustment procedures enable a distinction to be made between damage caused by insured and uninsured perils. These main natural perils covered in agriculture insurance include fire, flood, freeze, hail, wind, excess rain, and drought".

"*Premium*: The monetary consideration payable by the insured to the insurers for the period (or term) of insurance granted by the policy".

"*Risk*: 1) The subject matter of insurance; the insured property. 2) Uncertainty attached to the outcome of an event. 3) The probability of a loss. 4) The insured peril. 5) Danger".

"*Risk Management*: Care of risk to maintain income and avoid/reduce loss or damage to a property resulting from undesirable events. Risk management, therefore, involves identifying, analyzing and quantifying risks and taking appropriate measures to prevent or minimize losses. Risk management may involve physical treatment, such as spraying a crop against aphids or planting windbreaks and/or financial treatment, e.g., hedging, insurance and self-insurance".

"*Sum Insured*: The amount specified in the policy up to which the insurer will pay indemnities should the insured peril (s) occur and result in a loss to the insured property".

"*Uncertainty*: Not knowing whether an event is going to occur and being unable to measure the likelihood of occurrence of the event".

"*Awareness*: It is defined as farmers knowing the crop insurance or not knowing the crop insurance".

"*Socio-economic variables*: household assets, income, castes, category, livestock, etc.".

"*Demographic variables*: These include family size, education level, number of people earning a living, number of children, and so on."

"*Kharif Season*: It is a crop season in India and among its states; the season for Kharif cropping is from July-October during the south-western monsoon. The crops which are grown in the rainy seasons are also called Kharif crops".

"*Rabi Season*: It is also a crop season in India and among its states, the season for Rabi cropping is from October-March (winter). The crops which are grown at the beginning of winter and summer are also called Rabi crops".

Chapter - 2
Survey of Crop Insurance Literature

2.1 Introduction

A large quantum of literature is available on the promising line of crop insurance. The economists, academicians and research scholars of agriculture economics have studied a wide range of crop insurance topics, issues, and aspects. These include crop insurance evaluation, demand for crop insurance outside India, examining and quantifying the existence and effect of adverse selection and moral hazards, problems of crop insurance, premium rates and so on. In this present chapter, they start reviewing the research papers, articles and research work related to four major crop insurance issues. The first theme is related to the evolution and performance of the crop insurance system in India and United Andhra Pradesh. The second theme deals with the review of previous work of farmers' participation and its determinants. The third theme reviewed studies on farmers' awareness levels, perception and determinants of crop insurance since this issue is given less priority in India in general and United Andhra Pradesh in particular. Lastly, the fourth theme tried to review the earlier literature to identify and examine the determinants of crop insurance demand in several countries and, based on that, they estimated the crop insurance demand models for the selected villages of Nalgonda district, United Andhra Pradesh of India.

2.2 Survey of Evaluation and Performance of Crop Insurance (NAIS) In India

Dandekar (1976) discovered that agriculture is highly dependent on the monsoon and it serves as the primary source of income for the majority of Indians. Given that natural disasters cannot be prevented, he emphasized the importance of crop insurance in times of natural disaster. He has proposed a system of crop insurance for Indian agriculture, but it has a number of drawbacks, including moral hazard, adverse selection, and high administrative costs. To address crop insurance's limitations, the author proposes the development of a new crop insurance scheme, which is a crop insurance programme based on area approach. The area-level crop insurance policy eliminates moral hazard, simplifies the adverse selection issue, and decreases administrative costs. He noted that the region's area approach method should be homogeneous, either in terms of premiums paid, reimbursement earned, plant hazard, or agro-climatic conditions. He states that the primary actuarial function of the farm-level crop insurance policy

varies from year to year and is determined by the terms and conditions of payment, which also determines the premium rate. He proposed charging lower-risk areas for subsidies "slightly higher, but only slightly higher than required." Additionally, he advocated for direct assistance to small and marginal farmers in high-risk areas.

Lastly, he points out that it will be difficult to collect the premium if the crop insurance scheme is compulsory. If that is the case, an agricultural insurance policy can be viewed as a crop insurance policy in the short term. All crop loans must be mandatory, with mandatory loans deducted from loan advances. Indemnities against reimbursement could be modified and additional administrative costs raised.

Dandekar (1985) conducts a comparative study of India's crop insurance policy from 1976 to the present. Between 1979 and 1980, the general insurance scheme launched a crop insurance scheme based on field approach or area yield crop insurance. In collaboration with the state governments, Gujarat implemented the scheme in 26 districts, West Bengal implemented it in 23 districts, and Tamil Nadu implemented it in 17 districts. Further, the insurance scheme was eventually expanded to many more regions and sates in India. The primary objective of this study is to trace the systemic changes that occurred over time in the original crop insurance system and to determine why temporary solutions were introduced. He asserts that crop insurance should be mandatory for all borrowing farmers, or for a subset of borrowing farmers, as well as for those with low credit scores. He suggests that crop insurance and crop loan insurance will be merged and made available to each insured farmer, but that no separate policy will be needed.

In his paper titled "Government vs. Environment," Iftt (2001) examined the truth about crop insurance. In India, the far-flung crop insurance regime started in 1985 with the establishment of the "comprehensive crop insurance scheme (CCIS)." This CCIS had a number of flaws, including a low claim-to-premium ratio, high operating costs, and a provision for loanee farmers. The CCIS is augmented by the NAIS in order to address the above issues in CCIS agricultural insurance. The CCIS is augmented by the NAIS in order to address the above issues in CCIS agricultural insurance. Additionally, the critical inadequacies of the financial profitability target, the mandatory trigger, the inability to direct adverse selection from insurance, absolute premium

rates, and the area yield method are discussed. The program was a failure, but the Indian government dismissed other nations' failures with their own programs. Though private crop insurance is extremely common in a number of countries worldwide, there are many different forms of private crop insurance policies.

Sinha (2004) attempted to assess the consequences of a crop insurance scheme among the different states. He expressed India's agricultural insurance scheme's viewpoints, which differed from those of other early authors. India's General Insurance Corporation (GIC) used to provide crop insurance through rural financial institutions, but the Agriculture Insurance Company (AIC) recently took over the implementing agency's responsibilities from the General Insurance Corporation (GIC). "Various forms of crop insurance schemes are being introduced one by one in India, with the National Agricultural Insurance Scheme (NAIS) replacing the Comprehensive Crop Insurance Scheme (CCIS) and the Firm Income Insurance Scheme (FIIS) replacing the National Agricultural Insurance Scheme (NAIS)." He also suggests establishing a Calamity Relief Fund and a Rainfall Insurance Program (RFI). Mr. Sinha discovered in his research that NAIS has a low participation rate but a reasonably high claim-to-premium ratio. By 2002, the claims for premium ratio in Kharif were at 4.17, covering just 10 percent of the gross cropped area by NAIS.

Further, he has described the phenomenon of low levels of involvement, yet high claims. According to the interstate study, Gujarat (43 percent) is the top state followed by five states (Andhra Pradesh, Madhya Pradesh, Maharashtra, Karnataka, and Orissa) collectively account for 48 percent and the other states (Chhattisgarh, Tamilnadu, West Bengal, Uttar Pradesh, Bihar states collectively accounting for 9 percent). This describes a general problem characterized by adverse selection. The programme faces programme monitoring and control issues. He explains how a new Farm Income Insurance Scheme works, as per him, which is sole "crop income insurance and not farm income insurance, as this is a programme that seeks to protect income earned from a particular crop". The allowance is calculated first in terms of net profit and then by subtracting the loss from yield. FIIS history began with the issue of the minimum support price of food grains. As the assessment of insurance compensation would be done by the MSP.

These reports were updated with the disaster funds and precipitation insurance statistics. The centre and the state fund this fund for 75 percent and 25 percent respectively (CRF). The CRF must be used to meet the budgeted cost of supplying victims with rapid relief during severe climate events. In contrast, the rainfall insurance policy makes payments if the accumulated rainfall exceeds certain amounts. Mandatory flood insurance is meant to eliminate the risk of moral hazard.

Through this review, it was found that the crop insurance system managed by the government carries risks in monitoring adverse selection and moral hazard, but the crop insurance system managed by a private insurer carries all the risks. It is advantageous, but it tends to favor bigger farms. According to him, if the size and design of the risk contract make a suitable design, there is an opportunity for the distribution of public-private risk between these two extremes.

A study by Kalavakonda and Mahul (2005) examined the crop insurance program in India's second-largest driest state, Karnataka. They found that their product design, implementation problems and work issues were problematic. According to the findings, they attempted to develop an enduring crop insurance scheme that failed to meet either their explicit risk management or implicit safety net and suppression of dependent liability of central and state governments. The hypothesis results in insufficient coverage of acreage, insured farmers, and monetary activity. The crop insurance policy is focused on a cost-effective risk management strategy. They proposed that the scheme be updated with the most recent thinking and that an alternative be developed. Implementation is based on an area yield process.

In their paper, she makes a comparative study of the development of the "National Agricultural Insurance Scheme (NAIS) and the pilot Climate Based Crop Insurance Scheme (WBCIS)" under implementation in Odisha, India with respect to their coverage, monetary output and operational efficiency in providing a safety net for farmers in case of crop failure. The study used data from the second time series of 100 WBCIS users and 100 NAIS users from the Bolangir district and Kalahandi district of Odisha, India. The paper shows that WBCIS works better than NAIS because WBCIS is more widely used and has quicker and more regular payments. Results show that WBCIS is a more common security scheme than NAIS, but a multi-peril crop insurance scheme like NAIS is still compulsory due to the frequent natural disasters in Orissa.

According to Swain (2014) in India, facing environmental and price uncertainty, agriculture is inherently a risky undertaking, and more so in the situation of growing climate irregularities. Consequently, crop insurance is important to offer financial sustenance to growers to stabilise their income, help farmers to invest in agriculture, minimize their debt, and decrease the need for agricultural relief measures in case of crop failure. This paper assesses "the performance of the National Agriculture Insurance Scheme, and the pilot Weather-based Crop Insurance Scheme", and how they are doing in Odisha, the hot spot for climate change in India. Analyzing the specifics of those two programmes, the paper has shown that WBCIS tends to be doing better than NAIS due to higher coverage, higher percentage benefits for manufacturers, faster and more frequent compensation payments, and greater transparency. But the weather-related risks are omitted, and it costs less. Therefore, they can incorporate a mixture of the two schemes instead of needing to have a single scheme. Insurance firms should be allowed to provide farmers with priority insurance coverage in the same way as farmers having a priority loan for farming. If there is a strong demand for risk coverage, the public sector can offer catastrophic hazard compensation, but the private sector can provide more targeted insurance plans for less severe injuries and individual risks. In the face of rising agricultural risk as a result of climate change, insurance plans must be redesigned to instill appropriate constructive and reactive responses in insurance customers, not just as a risk transfer mechanism, but as a powerful tool for reducing risk and crop loss.

Vyas and Singh (2006) researched the ways that farmers are covered through the National Agricultural Insurance Scheme. This paper reviews NAIS and various reforms it may be in need. The paper is focused on a systematic assessment of a broad database of data for 11 crop seasons for a 2-year duration. Field interviews were conducted to assess the views of stakeholders in the states of Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, and Haryana. The study relies on interviews with informed people from many locations, including government officials from the Department of Agriculture, banks, scholars and farm members.

Townsend (1994) analyses the economic model by testing the model in three villages of a low-risk environment. The model incorporates many salient features of a low-income village economy. The data is well-understood, although it is not statistically significant. Over the long run, household consumption is not largely influenced by idiosyncratic shocks like disease or

unemployment (i.e., risk of village). Landless people have a different insurance status in one of the three villages compared to their neighbors in that village.

Mahul, Verma & Clarke (2012) reported on the country's major agricultural insurance programme. A design flaw, however, has resulted in all but 5 million farming households being unable to be covered. To address this and other issues, new regulations are being implemented, in this case through a private sector initiative. This new scheme will yield more time, better resolution of complaints, less manipulation of the allocation of government subsidies and cross-subsidies between groups of farmers, and a reduction in risk. Sustainable strategies can be developed to address these challenges, but immediate and full roll-out will be required. The paper describes all programmes and their successes, failures, and lessons learned throughout the process of creating the new system.

GOI. (2014) studies several aspects of Indian crop insurance schemes and considers their problems and challenges. Since the country's early days of crop insurance programmes, many of the problems and concerns that have arisen in the past have been chronic. Despite previous commissions' attempts, several of these issues still exist, causing crop insurance's operation to be problematic. This may be why, as trial, pilot, and more, crop insurance programmes have been launched from time to time over the past three decades, at times in rapid succession.

Agriculture in India is a rural agricultural practice, diverse, and vulnerable to natural disasters. Most farmers are small-scale and marginal. Agriculture fed a disproportionate amount of water, resulting in a higher degree of yield variability and crop loss. Crop insurance is subject to financial, design, and technical issues, which is intended to provide farmers with financial security but may not provide farmers with adequate yield. Because crop insurance uses information asymmetry, it has more serious moral hazard and adverse selection issues than other types of insurance, and it is more susceptible to co-variability. As a result, the insurance schemes result in several challenges. Systems of education based on the "area" method came into existence in the '80s. Insurance plans are based on forecasted risk and local area-based approach. Farmers are interested in crop insurance due to the vastness of the region, the high proportion of small-scale farmers, and the advent of area-based approaches. Therefore, effective coordination is essential for crop insurance programmes to function properly. However, governance issues and

interagency collaboration have posed challenges for the project. The Committee also looked from an analytical perspective at the experiences of earlier schemes beginning with the Comprehensive Crop Insurance Scheme (CCIS) while examining the various issues posed during its interactions and deliberations. This committee recognized that many of the previous committee's recommendations had not been or could not be implemented, resulting in unresolved issues. Because of technological advances, especially regarding mobile telephony, the Committee believes that the use of technology should be the main focus in addressing major challenges and issues. In order to facilitate timely operation of the crop insurance scheme, it is imperative to focus on a few critical aspects. The Committee reviewed the perspectives and opinions of investors, experts and policymakers in order to formulate its recommendations. The study evaluated the performance of allocation and management of crop insurance schemes operating in the country over the past decades, including organizational and governance issues. They are thankful to Sri Sharad Pawar and Sriprakash Bahuguna, both of whom set up the committee to research crop insurance schemes.

2.3 Review on Determinants of Farmers' Participation in Crop Insurance

More recently, Ifft (2019)examined how the participation of Federal Crop Insurance influences the physical environment by changing the incentives around the financial and production decisions of a farm, including the use of chemical inputs and other production practices. This study makes a unique empirical contribution by first using factor analysis to evaluate the degree of complementarity between a variety of decision-making groups, including rates of chemical input use. Data on these decisions is derived from the Phase II Agricultural Resource Management Survey (ARMS), a field-level survey that gathers detailed information on production and conservation practices.

They then looked at the relationship between enrolling crop insurance and managing nitrogen (N), a yield-scaled estimate of the environmental impact of nitrogen fertilizer. They also note that the large margin of crop insurance coverage is strongly linked to at least one indicator of responsible N use and that this relationship increases in magnitude as the frequency of the provisions increases (i. e. program type or coverage) and increases coverage levels. This means that what can, in this case, be called "sustainable development" can be simply the natural

outcome of a profit-maximizing farmer who is risk-averse but protected from the worst financial consequences by risk-management strategies such as crop insurance.

Barnett et al. (1990) researched crop insurance models for farmers in 13 wheat-producing states in the U.S. The Federal Crop Insurance Corporation (FCIC) has collected information on crop insurance activities. The National Agricultural Statistics Service (NASS) has collected information on acreage, production, and cost. This new population data is from the Advanced Agricultural Census (Census) of 1987 at the county level. Participation in the dependent variable was assessed as insured net acres separated by probably insured acres. FCIC has collected the data used in the analysis. This research is the first of its kind to establish an elasticity of crop insurance demand directly. This study uses multiple regression techniques to model the participation in county-level crop insurance for wheat produced in 1987. Observations were made in 13 major wheat-producing states from 346 counties. Counties were chosen based on the extent of wheat production and crop insurance activity history. The research has a range of relative strengths in this field compared to previous studies. First, in the creation of a participation model, only one crop is used. It is undesirable to combine some crops into a model of participation, as crops have different values and other properties that may be difficult to control in such a model. Second, the analysis represents a significant proportion of the crop model (more than 71 percent of the acres planted). Finally, the analysis incorporates information from a variety of sources to illustrate variations between countries.

Findings from the study are extremely timely as they indicate that policymakers should consider raising crop insurance premiums without significant harm to participation rates, given the unexpectedly low-price elasticity of demand. The results of this study suggest that some of the costs now borne by taxpayers could be passed on in the form of higher rates to farmers, as the costs of taxpayers are a major concern in the current debate. Nevertheless, the results of this study also indicate that participation rates would probably not reach the levels planned by policymakers during the Federal Crop Insurance Program's reform of 1980. The experience of the 1980s would mean that any Federal Crop Insurance Program will have to coexist with other federal yield risk management or catastrophe yield schemes in the future with such low participation rates. Younger farmers are also more likely to buy crop insurance as well as those with high debt-asset ratios. Crop insurance is only one way to cope with farm income risk, and

individual farmers may reasonably choose to forgo crop insurance purchases and rely instead on other risk management strategies. Older farmers are less likely to buy crop insurance than those with lower debt-asset ratios. Lack of data on individual yields and policies prevents the problem of adverse selection as a participatory determinant from being discussed.

While it may be fair for the customer to choose not to buy crop insurance, low aggregate participation rates pose a problem for the U.S. government. There is pressure to provide disaster relief to farmers suffering from crop losses when widespread crop failure occurs as the insurance participation rate is so low. Congress questions the adequacy of the crop insurance system and feels compelled to deliver catastrophe compensation ad hoc from the government. Such government disaster programs are costly and may reduce the incentive to participate in crop insurance, which was intended to be the primary government program for dealing with crop loss. The absence of certain data types somewhat narrowed this analysis scope. Having data for individual farmers on yield distributions and insurance policies would allow adverse selection testing and enhance the accuracy of existing yield and yield variability measures. Another important aspect to consider would be the opinion of a person on the possibility of free assistance in disasters. Crop insurance may not be an attractive risk management policy for a farmer who knows it is likely to be such free disaster assistance. Nonetheless, due to the strong correlation with other variables, attempts to include a parameter to estimate the probability of disaster assistance based on the correlation between county-level yield and national yield were ineffective.

Low turnout may be inevitable. Some studies show that the participation rate is rather low in elasticity concerning the return to insurance. Statistics provided here show that the likelihood of engaging in crop insurance is relatively low in elasticity. The government may increase the subsidy and thus raise the return, but the answer may be small. Further research is needed to underestimate the impact on the participation of improving actuarial soundness.

Wang and Shi (2016) discuss the new crop insurance programme in China launched in 2007, giving insight into how the insurance programme functions, specifically when it first implemented crop insurance in rural communities. This study surveyed households living in the village of Kuangjiaqiao, Changde, Hunan Province over a period of four years. This paper

describes the dominant factors influencing farmers' crop insurance decisions, by using simple regression models to identify delay effects for cross-sectional research and advanced models. Results suggest a complex adaptive cycle was established in farmers to adapt to the new crop insurance programme. Farmers initially made relatively arbitrary decisions that were greatly affected by customer demand and market pressures. Farmers were then better able to make rational decisions in which learning and participation had statistical significance. The main purpose of the paper is to focus on the initial stages of crop insurance, which helps us better understand the demands of the Chinese market.

All of the households in the town of Changde were surveyed in this study. Hunan was chosen as one of the first provinces to have their agricultural insurance programme launched (Wang et al 2011). The province of Hunan accounts for approximately 12.9 percent of domestic production. The amount of rice harvested in Changde is about 11.9 percent of the total amount harvested in Hunan. Of Changde's 14 districts, Changde has the largest crop insurance zone. In 2007, more than 104,000 hectares of crops were protected by insurance in Changde, with 314,000 hectares covered in 2010. Cross-sectional analysis and basic regression models were conducted with three samples collected from the insurance decisions of each household (2008, 2009, and 2010). Because of the lack of crop insurance in Kuangjiaqiao, the accuracy of 2007 crop insurance statistics is uncertain. Therefore, the amounts of insurance payable and the amounts of loss payable do not accurately reflect the 2008 sample.

The research paper of Bekkerman et al. (2012) assessed the impact of the SURE programme on production practices and to empirically evaluate the impact of the SURE programme on producers' decisions related to crop insurance. This paper outlines the SURE system design, and uses a stylized conceptual model that illustrates the effect of the SURE programme on farm-level crop insurance and production decisions. A cross-sectional statistical definition at county level is used to test if farmers most likely to benefit from re-optimization of production practice are more likely to participate in crop insurance. Analysis of empirical data shows that producers in SURE regions who are more likely to receive SURE compensation and less likely to exploit moral hazard opportunities are more likely to participate in the programme. The program's effects have not yet been rigorously studied, so projections about its long-term impact are unknown. Research indicates that the policy may have unintended consequences, with higher insured losses than

expected by the CBO and higher total subsidies for crop insurance and SURE plans. In the context of reforming the farm subsidies system, findings like these could have significant implications. Economic costs – High expenditures for subsidies on SURE and crop insurance services will reduce the level of social welfare. This is the first study to create a model describing how the SURE system changes farmers' responses and the effects on crop insurance participation.

More recently, study by Fadhliani et al. (2019) this research is to analyze farmers' awareness, understanding, and involvement in the implementation of the crop insurance program (AUTP) using information from 80 subjects in the sub-district of Suka Makmur in the Aceh Besar Regency in Indonesia. They view the awareness, perception, and involvement of farmers recorded based on frequencies using a questionnaire. The post hoc statistical analyses, one-way ANOVA tests were conducted to reveal significant differences in age, sex, education, household income, and rice field, and property ownership. The results show that, despite their participation in AUTP, only less than half of the farmers have a good overall understanding. Most subjects respond to the relatively low level of participation of AUTP. Depending on the independent, but gender variables, levels of awareness, understanding, and involvement are substantially varied. Overall, this study has demonstrated farmers' low level of knowledge, perception, and commitment to implementing AUTP crop insurance, which can have a significant impact on crop insurance system sustainability. It is therefore important to highlight the program in order to increase the level of knowledge, understanding and participation of farmers.

In an empirical study, Ifft & Jodlowski (2018) offered the ongoing discussion of the course and existence of the moral hazard issues associated with crop insurance in the agricultural economics literature. Advances in the understanding of crop systems in the ecological and environmental sciences have resulted in the creation of sustainability metrics which, perhaps unknowingly, greatly enhance this discussion. The Nitrogen Balance Measure recognizes that both the tails of the distribution of nitrogen use pose production and environmental risks. Environmentally responsible management of chemical inputs prevents over-applying and thus eating into their income while at the same time creating excess stocks of nitrogen ready to leach into the groundwater, as well as under-applying, affecting yields and potentially mining soil nitrogen and its organic matter. The combination of these two potential outcomes offers the perfect conceptual

framework to analyze how Federal crop insurance affects chemical use decisions along with a range of other production activities that are likely to impact the sustainability of US agriculture. They note that not only protecting farmers from the risk of loss of income using crop insurance is strongly linked to at least one indicator of prudent use of nitrogen, this relationship increases in magnitude as the scope of safeguards and coverage rates increases. Most maize production is now covered by crop insurance, and increasing coverage is linked to farm operators with a more optimal nitrogen balance. The relationship between different FCI use measures and the Nitrogen balance is more influential than the impact of other chemical inputs and most production practices. This means that what is called sustainable production, in this case, may simply be the natural outcome of benefit maximizing the risk-averse farmer, but insulated from the worst financial consequences by risk-management strategies such as crop insurance.

Ghazanfar et al. (2015) looked into the factors that make it difficult for Pakistani farmers to participate in crop insurance. The major factors that influenced the dependent variable "not willing to engage in" were classified using the Probit model. Crop insurance premiums were found to be the most important factor based on variables that had a positive and meaningful effect. Similarly, dissatisfaction with the crop loan insurance system, a lack of information about crop insurance, the belief that it violated Islamic law, and the lengthy process were all positive and had a major impact on the dependent variable. While the findings revealed that having limited decision-making power and risk was not sufficient.

2.4 Review of Farmers' Awareness, Perception of Crop Insurance and Its Determinants

Vandeveer and Loehman (1994) looked at how crop growers will respond to changes in crop insurance and how crop insurance compared to other types of disaster assistance while studying how crop insurance would affect crop growers. Maize growers in Tippecanoe County, Indiana, were polled in response to these updates. According to the findings of the report, such changes could dramatically increase demand for individual crop insurance in areas where it had previously been strong. Farmers can also guarantee higher yields. Finally, the rates and coverage of many different forms of insurance programs are contrasted.

Makki and Somwaru (2001) studied the selection of insurance contracts and the components that affect the option of farmers to engage in agricultural hazard insurance programs under several

economic and political circumstances. The study used data from the Risk Management Agency for the years 1995-99 and used artificial neural network technique to analyze insurance contract distribution in the United States. Benefit coverage was implemented in the second half of the 1990s, which increased farmers' participation in the crop insurance scheme. The risk level, expected policy benefits, insurance rates, and premium subsidies all influence the choice of yield and profit insurance policies. Demand in the scheme can be maintained by selling more goods in more places to meet the needs of specific producers, maintaining risk-appropriate premium rates and careful use of premium subsidies.

Another study conducted by Olila & Pambo (2014) on the factors of farmers' consciousness about crop insurance in Trans-Nzoia (Kenya). A binomial logit estimation method was utilized in empirical analysis to evaluate the factors affecting awareness. The primary data of 300 farmers at the farm-household level was collected using a systematic random sampling method. The study's key results were that the major determinants of awareness are household sex, employment, and income. The empirical results of this study gave policy visions on financial intervention among the rural poor on the basis of increasing agricultural output. Perhaps, policies that encourage the availability of credit might offer prospects for agrarian transformation. Further, information spreading to farmers in the form of extension services offers abundant opportunities for growing both farmer consciousness and uptake of crop insurance.

Nganje et al. (2008) focused on farmers' preferences for different crops as well as health insurance subsidy plans. Further, for the comprehensive healthcare and crop insurance services, a conceptual framework has been introduced that offers the opportunity to shift a portion of current crop insurance subsidy for better coverage for health. To test the indicated preferences of farmers for widespread insurance products, a random utility discrete selection experiment is used. Farmers prefer greater coverage and sensitivity to recurrence. The subsidy switch was not favored by a group of peasants. The subsidy change, though, was favored by older farmers, those with greater spending on health care, and farmers who have had major health problems.

Farmers' decisions to purchase crop insurance were investigated by Sherrick et al. (2004)and their range of products was evaluated. The perceptions of risk, the use of risk-reduction approaches, and socioeconomic and demographic disparities are all explored in this analysis.

Crop insurance is more popular among small, older, less tenured farms with higher potential yield risks. Scale, gender, perceived production risk, perceived importance of risk management activities, and other demographic factors all had an effect on consumers' crop insurance product choices, according to their research.

Ghazanfar et al. (2015) investigated crop-growers' awareness levels as well as factors affecting their perceptions of crop insurance in three Pakistani districts. Rajanpur, Bahawalpur, and Dera Ghazi Khan are all cities in Pakistan. To evaluate the factors that influence farm household consumption behavior, the Probit model was used. According to the report, 184 farmers had a basic understanding of crop insurance. Crop insurance information is available from news organizations and banks. The study's aim was to see how much "education" and "previously obtained agricultural credit" influenced crop insurance knowledge.

Sherrick et al. (2003) measured the relative prominence of crop insurance policy features using primary data from corn and soybean farmers in the Midwest (US). According to the findings of the joint study, the farmer's expectations for versatility control both insurance form and level of coverage. Demand for revenue insurance is higher for those who are larger, younger, and farm in more isolated areas. Furthermore, the study's findings are important and consistent across scale, insurance use, leverage, and risk perception. The findings enable rival insurance products' market shares to be measured across various consumer groups, providing suggestions for targeting particular classes of customers with new product configurations.

Using a choice experiment (CE) technique, Opiyo et al. (2014) examined the farmers' preferences for crop insurance design features in Trans-Nzoia County (Kenya). The application of the choice experiment method facilitated the estimation of willingness to pay as well as policy scenarios that represent a useful technique to notify policy design in a developing country framework. The study also employed a random parameter logit model. The results of the study found that growers are ready to pay for several features of crop insurance. Moreover, some of the significant characteristics were level of coverage, return, content design, risk coverage, nature of coverage and price of the policy. Furthermore, small scale farmers had a higher willingness to pay values than those of their large-scale counterparts. This was a realistic expectation given that

small-scale farmers were comparatively more vulnerable than large-scale farmers to vagaries of nature and resource constraints that obstruct their attempts to diversify.

Kumar et al. (2011) used data from 600 farm households in Tamil Nadu (India) to determine the perception of crop insurance and its determinants. For the analytical review of the sample, the Probit and Tobit approaches were used. According to the authors, 65 percent of farmers are aware of the government's risk-mitigation efforts. However, only 50 farmers are aware of crop insurance programs. The gross cropped area, the presence of risk, the number of workers in a farm household, the low premium rate, and income from non-agriculture all influenced crop insurance adoption among sample households.

Goudappa et al. (2012) used farm-level survey data to investigate crop insurance knowledge and perception in the North-Eastern region of Karnataka (India). To gather information from farmers, the researchers used a multi-stage random sampling technique. The authors discovered that nearly all respondents had the mistaken belief that banks would compensate them. The majority of farmers said that bank compulsion influenced their decision to purchase crop insurance. Crop insurance was chosen for a variety of factors, including financial stability and the benefit of others' experience. Furthermore, approximately 80% of farmers are unaware of the level of coverage fee, insurance procedure, due date, and loss assessment procedure used by an agricultural insurance company.

2.5 Review of Determinants of Demand for Crop Insurance

According to Karthik and Mani (2013) crop production in India is affected by natural disasters such as floods, droughts, climate changes caused by disease attacks, and adverse effects on crop production. The farmers prefer crop insurance as an alternative risk reduction policy in order to shield themselves from this situation. The paper discusses the new “Weather-based Crop Insurance Scheme (WBCIS), Southern Zone National Agricultural Insurance Scheme (NAIS), and Updated National Agricultural Insurance Scheme (MNAIS)”. The probit model and Garrett's ranking were used to study the determinants inducing the acceptance of crop insurance systems with reference to landholding (hectare), access to credit, age, education, access to non-farm income and access to irrigation as variables while lack of crop diversification, safe loss due to adverse climatic conditions, insurance benefits, obligatory for those who used crop loans,

supported by seasoned farmers, quick access to loans, financial security are influencing factors. The study observed a negative interception of the factors under all three schemes, while the factor of access to irrigation also adversely affects the adoption of crop insurance. Access to irrigation was non-significant in districts of NAIS and WBCIS, while districts of MNAIS were significant and negative at a rate of 5 percent. The main factor that influenced NAIS's adoption in this study was the lack of crop diversification, while MNAIS farmers fear that income losses due to crop failure (either drought or flood) are the major factors that influence NAIS's adoption. The fear among farmers that crop cultivation will inevitably fail is the most important factor driving crop insurance adoption in WBCIS. Thus, this study is confined to the southern region with vulnerable climatic conditions, Rabi season and data in 2011-12, not considered throughout India, all climatic conditions, seasons and affordability for investment.

Shah Fahad and Wang Jing (2017) find that increased climate threats would pose serious challenges to the agricultural growth of developing countries and will prompt farmers to buy crop insurance. The CV approach of interviewing people about how much money they will be willing to spend to remove future catastrophe threats has been used. Models of hypothetical market prices were built to assess the reliability of the WTP estimates. The study shows that demand for crop insurance varies according to factors such as access to credit, exposure to weather hazards, availability of irrigation, family size, education, and age. It found that largely agricultural ranchers who own large parcels of farmland are enthusiastic about purchasing insurance to guard their farms in contradiction of the risk of calamitous injury. The results of the study demonstrate that a portion of rural farm households (particularly small-farmers) are unwilling to purchase crop insurance and a standardized structure of crop insurance markets does not exist in the region. Crop damage varies according to the extent and scale of the disaster. Crop damage is determined by a number of factors, such as socio-economic status. A survey concluded that 30 percent of respondents supported the idea of crop insurance as a means for risk mitigation. When considering global warming and the probability of severe weather events, it is important to consider the magnitude and frequency of past weather-related disasters, farm typology, socio-economic settings, and the ability to pay for farming communities when introducing crop insurance in the region. Government support for subsidizing insurance schemes may increase the need for crop insurance among subsistence farmers and lessen the impact of the

weather on their livelihood. Although this research was from a specific province in Pakistan, the variables studied may vary in other regions within India as well as around the world. It is not feasible to provide reliable estimates for the dependent variable given the theoretical variables in the models.

NG'ANG'AH (2012) observed that the price of insurance, poor perception, risk and inflation are the major determinants of demand for insurance in the MATATU industry in Kenya. The regression analysis, ANOVA, Durbin-Watson static and F static are used for better performance of the study. The Adjusted R squared indicates that the model explains 77.7percent of the variations in the demand for insurance where 22.3percent is explained by variables outside the model. The D-B static is closed to the value 2, indicating that there is no auto-correlation. The F static indicates the variables are jointly significant. The correlation coefficients are significant at 5percent level of significance. The results show that insurance prices have a greater effect on MATATU insurance demand. The purchase of MATATU insurance is significantly and positively related to age, lack of awareness, inflation and poor perception towards insurance, in addition to providing strong evidence of a negative relationship with education. Pragmatic management of the premium system would improve and increase the demand for insurance products. Most respondents claimed that insurance companies are thieves who are only after taking but not willing to give back. As a result, the scope of this study was limited to demanding motor insurance rather than crop insurance.

According to Platteau et al. (2017) this study focuses on micro-insurance schemes that are affordable for the poor in order to protect against unexpected risks while harvesting. The expected utility theory has been used to study the variables that influence micro-insurance plans. The theory considered both getting insurance and its renewals. This involves paying a daily premium in exchange for an unpredictable payoff and is mostly designed as an individual package rather than a group-based system. Even when insurance was heavily subsidized and sold for less than its actually fair price, the study found that demand for micro-insurance was low. A risk-averse farmer is always going to prefer to earn a certain amount over a risky situation. Because of their aversion to unpredictability, risk-averse individuals are willing to pay more than the insurance's actuarially fair price, the price at which the insurance's average amount will be

paid out, in order to receive compensation if the harvest fails. This research, therefore, was related to micro-insurance, which was tailored for the vulnerable rather than for all classes.

Sakurai and Reardon (1997) this paper explored and evaluated successful demand for structured dryness insurance in the Sahel, Guinean Sudan, and western African semi-arid areas (WASAT). There is currently no formalized insurance in use; instead, households self-insure through income and asset portfolios. The study found that public food aid negatively impacted insurance demand in the Sahelian region, while off-farm income and livestock holdings were major sources of income in the three areas, but the positive effect on the Guinean area's insurance demand was negligible. The crop stocks in the Sahelian region have a significantly negative effect, while crop stocks in the Guinea and Sudan regions have a significantly positive impact. Therefore, testing the planned area's standardized drought insurance will be needed.

The paper of Smith & Baquet (1996) research is the first using Heckman's two-stage estimation methods to model farmers' participation and coverage decisions separately. This study used cross-sectional data from a large, random sample of producers of Montana wheat to examine individual farms' demand for crop insurance. The stage of the decision to engage in the crop insurance system and the appropriate level of coverage was measured using econometric analysis. Both the decision to participate and the choice of maximum compensation or coverage in the models are positively and significantly related to the farm operator's assessment of highly variable yields. Goodwin also discovered that as loss ratios increased, the MPCI (Multiple Peril Crop Insurance) elasticity of insurance premiums for premium rates decreased due to adverse selection, and that higher premium levels resulted in higher loss ratios. Adverse selection has resulted from which the loss exposure was limited to a total of 75 percent of the average yield. Therefore, this study was confined to U.S. wheat farmers and evaluates why insurance decisions should be made by farmers.

Sai, Yulian & Xiaofeng (2010) tried to discover the factors that affect farmers who purchase or do not purchase agricultural insurance so that insurance providers, state-owned agricultural insurance companies or commercial insurance companies may change their strategic needs to meet the needs of families on the basis of their findings and the unique characteristics of China

in rural areas, such as large rural populations. and stated-owned land system. They also provide some suggestions in this paper on how to improve policymakers' agricultural insurance in China.

Hill, Robles, and Ceballos (2016) investigated the demand for simple rainfall-based weather insurance products among farmers in rural India. Data from a randomized control trial on the existence of demand in terms of price, hedge basis, and risk aversion were used to test the predictions of a generic expected utility theory model. They conclude that demand is consistent with expectations, but that it declines as cost and base risk rise, and that risk aversion is hump-shaped, with price sensitivity declining as base risk rises. They estimate a negative price elasticity of 0.58% and estimate that doubling the distance from a reference weather station decreases demand by 18%. These findings suggest that increasing the price and performance of insurance products will directly increase demand. They also look at how insurance preparation affects other processes that help people understand things better. Increased incentives to use learning or learning to increase understanding and demand, according to the evidence, are more successful. Finally, they are gradually contributing to the sparse evidence of insurance demand. In terms of their main interventions, they discover that premium subsidies have a long-term impact, while the impact of new weather station investments is diminishing, and the effect of enhanced first-season training tends to fade during the second season. It's worth noting that obtaining a refund from a previous insurance purchase does not guarantee future acceptance. This may be due to product or insurance provider trust problems, and it's a subject that needs to be researched further.

Enjolras & Sentis (2008) using information from a descriptive survey of French farms (FADN-RICA) for 2002-2005, examines the numerous features that lead growers to insure in contradiction of crop risk. A mix of standard human, financial and agricultural criteria is taken into account in their study. The key variations between insured and non-insured farms are underlined by cross-sectional and longitudinal analyses as well as logistic regressions. Insured farms have greater financial and agricultural sizes, more diversified growth compared to non-insured farms, and have been affected by recent catastrophic climate events. While important in the cross-sectional analysis, it mitigates the impact of financial parameters on the insurance decision. On the other hand, the farm's agricultural features affirm their leading impact on crop insurance plan subscriptions.

Cai (2012) explores how financial goods and services can boost economic growth and overall household welfare, but there are slow acceptance rates for these products. In this report, he explores the barriers to innovation diffusion, recognizes and addresses potential solutions to the issue, and investigates the impact of technology usage on household behavior through a combination of empirical and non-experimental techniques. The effect of social networks on the decision to adopt a new weather insurance policy, as well as the mechanisms by which social networks operate, are the subject of the first chapter. In the first year, he provided financial education to a random subset of farmers and discovered that the social network has a significant impact on insurance take-up: for uninsured peasants, having an extra friend who receives financial education increases take-up by nearly twice as much as receiving financial education directly, a spillover effect equivalent to offering a 12 percent reduction in the premium. Using randomized default choices, I show that the positive influence of the social network is driven by the diffusion of insurance knowledge rather than scale impacts, imitation, or informal risk sharing. While social networks continue to affect insurance demand, social networking habits have a 50 percent direct effect on insurance take-up. In villages where families are closer together and people who first receive financial education are more important to the social network, he discovered that social networks have a greater effect. The paper is based on an article about buying insurance from a fictitious rural Chinese company. This chapter employs a novel experimental design to see if weather insurance is a more effective way to defend against weather danger in rural China. He selects a group of low-income households at random and discovers that actual insurance coverage has expanded by half. They examine whether the impact is due to (1) changes in hazard perceptions, (2) changes in perceived probability of potential disasters, (3) empirical benefits of insurance testing, or (4) theoretical knowledge of catastrophe to ascertain the mechanism behind it. The mechanisms are unable to explain effects (1) through (3), but insurance experience may be able to explain the experience. They devised a basic model in which agents are less likely to consider disasters and benefits due to their rarity. The figures show that the recent insurance game experience has the largest impact on real insurance acceptance, implying that learning from experience has a significant impact on recurrence. In the third chapter, the author examines whether a farm insurance policy affects economic growth, family dynamics, and savings in rural Kenya using a natural experiment and a large household-level panel dataset. The difference and triple difference between definitions was calculated using

the analytical technique. He discovers that, first, insurance increases insured crop production area by approximately 20 percent and decreases production diversification; second, insurance increases credit demand by 25 percent; third, household savings are reduced by more than 30%; and, fourth, the long-term effect of insurance policy on borrowing continues, though savings are reduced by more than 30 percent.

Fahad et al. (2018) found that Pakistan is unequipped to cope with severe weather events. As such, due to natural disasters, there is a chance of casualties for several years. However, the national government has failed to provide crop insurance in Pakistan. As a result, little is known about crop insurance adoption in Pakistan. The purpose of this research is to provide help for Pakistani farmers by determining the factors that influence their implementation of crop insurance as a risk management approach. A questionnaire was used to collect data from 400 randomly selected farms in the four most flood-prone regions in the northwestern sections of Laos (Khyber Pakhtunkhwa). The relationships between a variable and another are evaluated by using a Probit model. Risk attitude and risk perception in regard to flood risk were assessed and used as direct and indirect independent measures. Farm households' decisions to purchase crop insurance is strongly influenced by gender, farming experience, education level, ability to fund insurance, perception of flood risk, land ownership status, access to knowledge sources, land ownership volume, and river distance. The findings of this study will influence state laws, insurance plans, and policymakers' behavior. To improve the livelihood of small farmers, the government should subsidize and frame a scheme, and crop insurance awareness should be increased.

Goodwin (1993) evaluated the soundness and effectiveness of crop insurance policies; farmers must have knowledge of the factors that affect their decisions to buy crop insurance. Given how critical crop insurance is, little empirical work has been done on the topic. This study investigates the market for crop insurance among farmers in Iowa. Different elasticity of demand suggests different prices paid by consumers at different levels of loss risk. The possibility of failure is accounted for and the elasticity of demand is tested and proved to be affected. The data show that-0.32 elasticity exists for relative insured acres, and-0.73 elasticity exists for liability per planting acre. Various implications regarding the soundness of the insurance industry are presented.

Okoffo et al. (2016) looked at Ghana's economy and how natural factors including climate change, pests and diseases, and bushfires affect it. Agriculture is a vital industry that is fraught with risk. Pests and high temperatures threaten farmers in Ghana's cocoa-growing area, which can lead to crop failure. Farmers must plant the appropriate crops to protect their fields. Insurance was a low-risk investment. The aim of this study was to find out how cocoa farmers felt about insurance, what factors affected their willingness to pay (WTP), and how insurance companies were able to offer coverage to them. 240 farmers from four communities in the Brong-Ahafo Region were surveyed using a multi-factor sampling technique. Farmers' willingness to secure their farms was significantly influenced by age, marital status, and education, while farmers' willingness to secure their farms was negatively influenced by household size and crop area, according to the report. Similarly, the farmer's age, household size, crop location, and marital status had a significant and positive influence on how much he was willing to pay for the cacao. Farmers were able to pay $128.40, $122.10, and $49.32 for crop insurance per production cost per acre, according to the contingent valuation process, at high and low rates. Crop insurance is not usually offered by insurance firms to farmers. They are, however, able to offer crop insurance to cocoa farmers who practice good farming practices. Farmers should be well-versed in crop insurance, according to the report, and should actively engage in crop insurance planning to ensure that they receive the premiums that they are entitled to.

Shaik (2013) analyzed the yields using a two-way random effect variable based on an alternative two-way random effect panel estimator. The study conducted using United States data indicates that the modified crop insurance panel system overestimates (overestimates) performance relative to the pool model in at least 35 (13) countries. A three-year comparison between 1960, 1980, and 1996 revealed differential trends. The final panel model estimates the greater effectiveness of the crop-free model than that of the current crop insurance model.

In a study by Enjolras, Capitanio & Adinolfi (2012) examined the factors that affect the decision to insure crops in France and Italy. These neighboring countries are highly subsidized by a changing system of insurance from a public fund to private policies. Given the stakes associated with the reform of the CAP crop insurance, market size, government involvement, few studies have been drawn on this subject. The financial and agricultural literature allows for the

development of a two-stage empirical model that measures the elasticity of demand for crop insurance and determines its main determinants. France and Italy have similar product payment systems and the ability to pay. Farmers' insurance sensitivity, on the other hand, varies greatly across the Alps. This led to a discussion on the establishment of a European-wide insurance market.

In a study, O'Donoghue (2014) noticed the low enrolment rates reported for the first 50 years of the Federal Crop Insurance Program. In 1994 and 2000, the legislation introduced premium reductions to increase plan enrollment. The increased number of students and subsequent increase in tuition has caused substantial increases in the program's expenses. This analysis examines how premium subsidies affect crop insurance demand across major crops and agricultural regions. Subsidies encourage farmers to enroll more land in the program, but they primarily encourage farmers to adopt more acres enrolled in the program from region to region and crop to crop, and producers are more sensitive to changes in subsidies. When improved premium subsidies are available, farmers might be more inclined to purchase crop insurance to help mitigate farm risks.

Browne & Hoyt (2000) their present study focuses on the 1983-1993 U.S. financial experience. National Flood Insurance Program (NFIP) to examine the theoretical determinants of the flood insurance purchase decision. Empirical analysis supports the hypothesis that income and expenses are important variables in one's decision to buy flood insurance. State-level flood insurance rates over the previous year have been shown to be highly correlated with the flood damage based in the state.

Wang et al. (1998) demonstrated how to determine the quality of individual farm yield and area yield crop insurance programs using statistical analysis of expected value and simulation techniques for a typical Iowa corn farmer. The existence of the yield index that causes insurance payments, alternative coverage criteria, and alternative pricing mechanisms have all been investigated as contract design considerations. Farmers' engagement and welfare are assessed, and performance is analyzed in a portfolio environment where farmers have access to potential prospects and options. The degree of correlation between individual farm yields and area yields

is found to be especially sensitive to restrictions on coverage levels, premium load size, and the size of premium loads when comparing the performance of different crop insurance designs.

The degree of correlation between individual farm yields and regional yields has been shown to be especially sensitive to coverage rate constraints, premium load size, and the relative quality of various crop insurance schemes. Farmers were given a policy to evaluate their interest in the scheme as well as how the features of insurance and farmers influenced their decision to buy insurance. Farmers were also polled about their growth, price, and yield strategies, as well as their financial and personal characteristics. Even before taking into account certain policy expenses and government budget limitations, there is no compelling argument for establishing a crop insurance scheme in this case. Crop insurance is not necessary to achieve policy objectives such as raising farmers' incomes or maintaining subsistence income levels, according to the findings, despite the fact that farmer participation is important. Litchi production does not need crop insurance because it is already expanding rapidly in comparison to other farms due to its high productivity. When it came to coverage, farmers preferred higher yield guarantees and lower compensation rates. Farmers did not respond to adjustments in premiums because estimated premiums were low as a percentage of expected income. Farmers with high incomes were more likely to be interested, according to econometric analysis, but the characteristics of other farmers appeared to be unimportant. According to anecdotal evidence, farmers claimed the estimated yield of the region used to set insurance coverage levels was too poor. The most significant problem in the design of the programme seemed to be determining suitable values for predicted area yields and insurance coverage rates, since litchi productivity varies greatly depending on tree age and the area planted with litchi grows rapidly. Farmers' knowledge of the relationship between area and farm yields, as well as other aspects of area insurance, is thought to increase the scheme's operation.

2.6 Research Gaps from the Literature Review

We have made a survey of past literature mainly on four main themes of crop insurance issues. Specifically, the first theme focused on a survey of the studies related to the performance of NAIS in different states in India. The second theme was a review of studies on the features that influence farmers' participation in crop insurance schemes. The third theme concentrated studies

on analyzing and identifying farmers' awareness, perception of crop insurance and the final theme made an effort to study the determinants of demand for crop insurance. The survey of literature on the above said four aspects include both national and international studies and also covers both theoretical and empirical studies. The survey of literature on the said themes found the following gaps in earlier literature.

Firstly, it is found that the growth and development of crop insurance performance is a dynamic concept and earlier researchers have studied its performance by considering the data up to the year 2007-08 and none of them have compared the crop insurance schemes, particularly, National Agriculture Insurance Scheme performance from India to United Andhra Pradesh. Therefore, this is the first reason for the analysis of our first objective to analyze the performance and development of the National Agriculture Scheme in United Andhra Pradesh and India in our dissertation. The present study analyzed the performance and development of NAIS data since its inception to 2013-14.

Second, in addition to the foregoing, no study has attempted to study the determinants of farmers' participation in crop insurance at the United Andhra Pradesh and India levels using secondary data from the AIC of India. Therefore, the second objective of our dissertation has focused on how the farmers' participation in crop insurance is affected or determined by using the panel regression models. Further, we did not find any previous research related to the analysis of crop-wise and season wise farmers' participation in crop insurance. So, the second objective also includes these aspects of farmers' participation in NAIS considering crop-wise and season wise participation.

The third theme of the review of the literature found that only a few studies have been found to address the farmers' perception, awareness level and determinants of crop insurance awareness in India and most of them belong to foreign countries. These studies have analyzed the farmers' awareness level and perception of crop insurance in general. They did not compare the farmers' awareness levels, perception and the determinants of crop insurance awareness to the different ecosystems like a rain-fed and unirrigated ecosystem. As a result, in the third objective of our thesis, we investigated differences in farmers' perceptions and levels of crop insurance awareness

by considering and soliciting opinions from farmers from two different ecosystems, namely the rainfed ecosystem and irrigated ecosystem.

The final theme of the review literature found that the factors affecting the crop insurance demand were analyzed largely by foreigners. None of the studies examined the determinants of crop insurance demand in India. The foreign studies also did not study the crop insurance demand determinants for the different ecosystems, namely rainfed and irrigated ecosystems. As a consequence of this, to fulfill the gap in literature, our final objective is designed to study the determinants of crop insurance demand in two different ecosystems by using qualitative regression models and comparing and analyzing how the determinants are different in different ecosystems.

2.7 Summary

This chapter has reviewed some important studies on crop insurance, both theoretical and empirical, both for India and other countries of the world. The availability of past research work on crop insurance is very high, but the majority of these studies represented foreign countries. In this chapter, we reviewed mainly on four major themes. These four main themes are a) crop insurance scheme development and performance, b) determinants of farmers' participation in crop insurance, c) farmers' awareness levels, perception, and its determinants and finally, d) determinants of crop insurance demand. Followed by the review of literature, we have identified some research gaps based on which objectives of the present study have been outlined.

Chapter - 3
Secondary and Primary Data, Sample Design and Profile of Study Area

3.1 Introduction

In the preceding chapter, we presented a detailed survey of prevailing literature on the four different facets of crop insurance and ended with the identification of the research gap. The presentation of the research methodology including econometric models and the corresponding method of estimation and data will be discussed in this chapter.

This chapter explains the sampling technique employed to collect the primary data and the justification behind selecting the state, district, mandals and, lastly, the villages to be studied. Subsequently, a general overview of the sample district and a detailed profile of the two villages from two mandals are explained. More specifically, it attempts to describe geographic and demographic, climatic and rainfall behavior, occupational distribution, distribution of operational land holdings, land utilization pattern, cropping pattern, irrigation, agricultural production, farmers' perception of crop insurance, demand for crop insurance and its determinants, farmers' experience with crop insurance, farmers' awareness of pre-crop insurance, and farmers' awareness of pre-crop insurance. These descriptions are explained based on the information collected in my field survey in two villages and also from some secondary sources. This chapter has been categorized into seven parts. The first part provides a brief introduction about Telangana, a state in South India. Its demographic, historical aspects, agro climatic zones, and agriculture sector indicators were analysed. The second section deals with the selection procedure of the district, mandals and study villages and data collection. The third part deals with the field survey and data collection through the structured survey form and a brief introduction to study villages. The fourth section deals with infrastructure facilities in the study villages, such as electricity, communication, irrigation sources, and agriculture credit sources have been analysed. The fifth part of this chapter analyses the data collection tool survey form. Problems encountered by me and my friends at the time of primary data collection are explained. In section six and the final section provide the gist of this chapter.

3.2 Introduction to Research Methodology

Research methodology provides appropriate guidance and direction in the correct and meaningful and proper conduct of an examination or study. In this respect, the present chapter explains the approaches and methods deployed in the conduct of this research study. These methods and procedures are offered under the following sections:

1) The design of research.
2) The population and sampling selection procedure.
4) Instrumentation, scales, and measurement.
5) Procedure of data collection.
6) Procedure of statistical and econometric analysis.

3.3 Research Design

Research design is a method of performing an experimental examination to prove or disprove a claim to knowledge and denotes all actions taken by a scientist to investigate a specific set of research questions or hypotheses (Borg and Gall, 1989). A good research design is required to provide practical guidance for research activities, and it should be suitable for the hypotheses to be tested, practicable within the limits of available resources, free of bias, free of confounding impact, and statistically reliable (Wiersma, 1975).

The current study used a descriptive research design, in which data was collected using a survey to answer questions about people's insurance awareness, as well as socio-economic factors that influence whether or not they use agriculture insurance as a risk mitigation strategy. A questionnaire with open-ended and closed-ended questions was used to collect data in order to obtain cross-sectional and comparative information.

3.4 Population of the Study Area

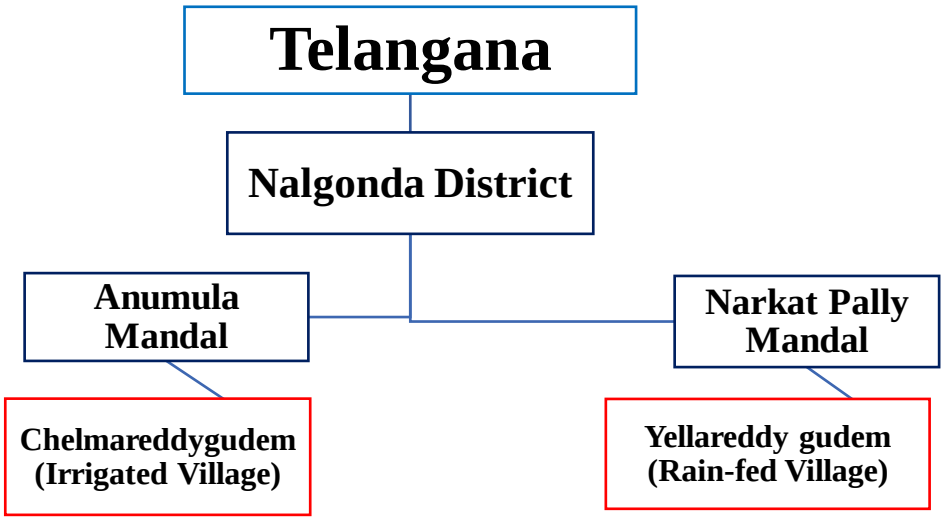
The population of the present study included all those farmers who were involved in agriculture production activities and subscribed to the crop insurance (all loanee farmers from two villages, namely Yellareddygudem and Chelmareddygudem) from two villages of Nalgonda district of United Andhra Pradesh.

3.5 Procedure of Sample Selection

The basic need for doing a primary survey depends upon the study objectives. Crop insurance can clarify the present status and performance of crop insurance of the nation, state or region at the aggregate level and its comparative position in agriculture insurance among countries of the world where it is being implemented. This macro-level comparison cannot provide straightforward and satisfactory answers about the basic factors and constraints that contribute to low crop insurance knowledge and participation, as well as the factors that motivate and determine crop insurance items. To find answers to all of these questions, we'll need to conduct primary surveys and analyze data at the micro level, taking individual beneficiaries into account (farmers). As a result, a field survey with individual farmers and households as units of observation is needed. The primary survey entails a lengthy process to arrive at the primary survey unit, i.e., the home, and to do so, we must first locate the appropriate district and research villages. The study's primary objectives, which include a comparative review of beneficiaries' knowledge, participation, determinants of crop insurance demand, and constraints involved in its adoption in both irrigated and rainfed ecosystems, guided the selection of study districts and study villages. The necessity of studying production loss due to various climatic threats, inappropriate crop management, and the permanent high Florien content in the groundwater is an additional adverse condition for the farmers of Nalgonda district, and farmers' coping mechanisms in both ecosystems is another rationale for selecting the district. We chose one district from Telangana State, namely Nalgonda, for this research. The irrigated and un-irrigated habitats coexist in the Nalgonda district, which is located in Telangana's southern agro-climatic region. Yellareddygudem (rain-fed ecosystem) and Chelmareddygudem (irrigated ecosystem) were chosen from Narkatpally and Anumula mandals in Nalgonda district, respectively. According to Chand et al. (2010), a region is considered irrigated if it has 60% of its cultivable land covered by water sources. As a result, we've chosen two villages from two separate ecosystems, allowing us to investigate differences in crop insurance benefits among the beneficiaries of the two study villages. When selecting the study villages, a lengthy process was followed, as well as a number of underlying principles. Primary data was collected from 430 farmers in Nalgonda District, UAP, with 215 farmers from Chelmareddygudem village representing totally irrigated typologies and another 215 farmers from Yellareddygudem village representing a rain-fed typology. From October to December 2016, a field survey was conducted

in the aforementioned villages. The study state, district, mandals, and villages were chosen using purposeful sampling. Farmers from each of these selected villages, Chelmareddygudem and Yellareddygudem from Anumula and Narkatpally mandals, were chosen for the survey based on their best agricultural production results, high standard of living, best agricultural practices, and zero farmer suicides. In the tree chart below, the specifics of the sample collection process and farmer distribution are shown, as well as the reasons for the study villages' selection.

Figure 3.1: Procedure of Sample Selection



Rational for the Selection of the Sample Villages:

The phase-by-phase process for selecting research villages begins with district selection, followed by mandal selection, and finally village selection, as shown in the tree map (Figure 3.1). The study villages were selected for the following reasons in accordance with the study's objectives:

- My study villages are located in two different mandals of the Nalgonda district, and they are not equally far from the district headquarters; for example, the rain-fed village is 10

kilometers from the district headquarters, while the irrigated village is 55 kilometers away. To find the differences between the farmers' perceptions of crop insurance performance and awareness of crop insurance schemes, the villages are selected likewise.

- The population size and number of households and soil types of the two sample villages are almost similar.
- All the farmers who have landed in their names have taken crop loans from commercial banks, co-operative banks and regional rural banks attached to the villages. As a result of this, all the farmers have to buy crop insurance. For this reason, we tried to analyse why farmers were unaware of crop insurance.
- Despite crop losses in these two villages, no farmer in these two villages has committed suicide in the last ten years. This information has been sought from the agriculture officers after a thorough inquiry.
- Approximately 70 percent of the land in the irrigated village is connected with the tank linked with a dam and canal irrigation with two tilling features. Farmers can farm to these guaranteed irrigation sources in both the Kharif and Rabi seasons. Nevertheless, 70 percent of the farmers in the rain-fed village cultivate after the southwest monsoon begins and cultivate once a year in the Kharif season, while 30 percent of the land is cultivated during the Rabi season.
- Farmers face a variety of climatic threats, each with its own characteristics and scale. Floods and crop diseases are the main threats in the irrigated area of the study villages, while drought can occur at any stage of crop growth in the rainfed region. As a result, it will be easier to comprehend the crop insurance as coping strategies used by farmers in these habitats.

3.5.2 About the Survey Form

The structured survey form has been prepared for the gathering of primary data from the two ecosystems or villages selected from the Nalgonda district. This questionnaire contained several questions that are broadly categorized into six parts.

- The part one of the survey forms deals with the basic information about the village and demographic profile, including names of the family members, age, sex, education level and relation with the family head are collected.

- The second section tries to collect the data on farmers' landholding details by posing several questions like the land size in acres, land quality, land ownership, type of lease, the main source of irrigation and land value.
- The third part of the questionnaire deals with the household fixed assets and livestock information, farmers' perception of rainfall, main sources of irrigation, crop-wise area of cultivation, crop yield, income, cost of cultivation, other than agriculture income sources of the family have tried to elicit the information from the respondents.
- The fourth section collected information on sources of agriculture finance, rate of interest, repayment methods of loans, loan waiver scheme beneficiaries, causes of crop loss and sources of risk mitigation in agriculture.
- The fifth section of our survey form attempts to collect information on crop insurance awareness, sources of crop insurance awareness, crop insurance details, premium rates, premium subsidies, other than crop insurance compensation received by farmers, type of insurance service provider, farmers experience with crop insurance, and crop insurance suggestions.
- The last section of the survey form deals with eliciting information on farmers' awareness of WBCIS and livestock insurance schemes and any other suggestions and comments from the respondents on cop insurance schemes.

3.6 Data Collection

3.6.1 Primary Data

The data gathering method for this study utilized a cross-sectional survey design. This process involved the gathering of data at a point in time from a random sample on behalf of given inhabitants at that time (Wiersma, 1975). After the development of a well-designed questionnaire incorporating all the aspects and characteristics related to producing the essential information to analyse the determined objectives of the thesis, initial permission was granted from the supervisor for field survey. Further, continued collecting data for this study, prior oral consent was sought from the Mandal Revenue Officer of concerned mandals, Village Revenue Officers of concerned villages, Agriculture Officers of concerned mandals and villages and Village Sarpanch or Grampanchayat President. Data was collected from October to December 2016 via

personal interviews using the pre-coded questionnaire. There are several advantages to this method of data collection. According to Miller (1983), interviews can yield information that is likely to be more accurate, it allows the use of scoring and testing devices, and it collects additional information about the characteristics of the respondents, and can usually control which person or individuals respond to the questions. Help from friends of Mahatma Gandhi University, where I did my Masters, was asked in the conduct of the interviews. They were given suitable consultation, briefing and training before the field or primary data collection process.

3.6.2 Secondary Data

To study the first two objectives related to the thesis, the secondary data was utilized, which was received from the Regional office, Agriculture Insurance Company of India Limited, Hyderabad. The state-level balanced panel data is prepared for major Indian states, including United Andhra Pradesh, Karnataka, Maharastra, Chattisgarh, Madhya Pradesh, West Bengal, Odisha, Uttar Pradesh, Jharkhand, Gujarat, and Assam. The state-level balanced panel data is prepared for both crop seasons, namely Kharif and Rabi. The justification for the choice of these major states is the availability of the secondary data and their performance in the crop insurance business in general and their performance in the National Agriculture Insurance Schemes. Similarly, the district level balanced panel data was also prepared for the selected districts in the united Andhra Pradesh. District level balanced panel is prepared both for the two crops, namely cotton unirrigated and paddy Rabi and Kharif seasons. The period of the study of data for the state level panel is from 2000-2012 and district-level data covers from 2004-2013 for both crop seasons, namely Kharif and Rabi. The crop-wise NAIS data is not available for the major states in India and only aggregate performance of NAIS statistics is available, but crop-wise NAIS data is available for major districts in United Andhra Pradesh and district wise aggregate data is not available. Therefore, we have examined the determinants of farmers' participation in NAIS generally for the major states' aggregate NAIS data and crop-wise for districts in UAP. The balanced panel data is prepared for India's major 12 states and ten districts in United Andhra Pradesh.

3.7 Statistical and Econometric Analysis Procedures

Data collected from respondents through personal interviews is entered into MS Excel sheet using the variable names and codes and data is analyzed using the computer sub-programs and software packages for economics like the Stata version 12 and Statistical Package for Social Science (SPSS) version 22. Later, to facilitate the data examination, the below mentioned statistical and econometrics procedures/tests were employed wherever required.

- Frequencies and relative frequencies Tables were constructed to compute the frequency of different variable sums and elementary or basic statistics for all the variables in the present study.
- Percentage Growth Rates and Average Annual Growth Rate
- Compound Annual Growth Rate
- Panel Regression Models to identify the determinants of farmers' participation in NAIS.
- Probit Model Regression to determine the association between two or more independent variables and a single qualitative dependent variable which is binary in nature.

3.8 A Brief Introduction of Telangana State

This section deals with the selection of the state, history of the state, demographic information, land utilization pattern, rainfall information, different agro-climatic zones and agriculture indicators of Telangana State.

3.8.1 Brief Historical Introduction of Telangana

Telangana is the 29th state of India. It is bordered by Maharashtra on the north, Karnataka on the west, and Andhra Pradesh on the east and south. The region has a population of 350.04 lakh people and an area of 276.96 lakh acres, according to the 2011 census. The state is the India’s 12th largest in terms of geographical area and population.

As a result of district reorganization, the state now has 31 districts: Yadadri Bhuvanagiri, Warangal (Urban), Warangal (Rural), Wanaparthy, Vikarabad, Suryapet, Siddipet, Sangareddy, Rangareddy, Rajanna Sircilla, Peddapally, Nizamabad, Nirmal, Nalgonda, Nagarkurnool, Medchal, Medak, Mancherial, Mahabubnagar, Mahababad, Komaram Bheem Asifabad, Khammam, Karimnagar, Kamareddy, Jogulamba Gadwal, Jayashankar Bhupalpally, Jangaon, Jagtial, Hyderabad, Bhadradri Kothagudem, Adilabad. In 2019, two new districts were created, Narayanpet and Muluguand as a result the total number of districts reached to 33.

Figure 3.2: Map of Telangana State

Source: Agricultural Statistics at a Glance, Telangana 2015-16

Figure 3.2 is a map of Telangana State which includes 33 districts, Nalgonda district is one among them, identified the same with the arrow line. Further, the Nalgonda district map is mentioned in the introduction part of the profile of the district.

3.8.2 Geographical Features of Telangana

Telangana is situated on the Deccan Plateau, in the center of the Indian Region's eastern coast. It covers an area of 112,077 square kilometers (43,273 sq mi). The region is drained by two major rivers, accounting for approximately 79 percent of the catchment area of the Godavari River and approximately 69 percent of the catchment area of the Krishna River, but the rest of the land is arid. Telangana is also drained by a number of minor rivers, including the Bhima, Maner, Manjira, and Musi.

Telangana has a semi-arid climate that is hot and dry. Summer lasts from March to May, with average high temperatures of 42 degrees Celsius (108 degrees Fahrenheit). The monsoon season starts in June and lasts until September, carrying 755 millimeters (29.7 inches) of rain. From late November to early February, the weather is dry and mild, with little humidity and average temperatures in the 22–23 °C (72–73 °F) range.

3.8.3 Demographic Features of Telangana

According to Census 2011, the Telangana state population was 3.50 crores with a rise from 3.09 crores in the 2001 census (Table 3.1). Rural areas account for 61.12 percent of the state's population, while urban areas account for 38.88 percent. Between 2001 and 2011, the total population increased at a rate of 13.58 percent, down from 18.77 percent the decade before. In urban areas, population growth has been gradually growing. Between 2001 and 2011, the state's urban population increased by 38.12 percent, compared to 25.13 percent the previous decade. In stark comparison, the state's rural population increased by 2.13 percent, significantly more than the UN's projected global population growth of 1.23 percent (Census, 2011).

Table 3.1: Demographic Features of Telangana State

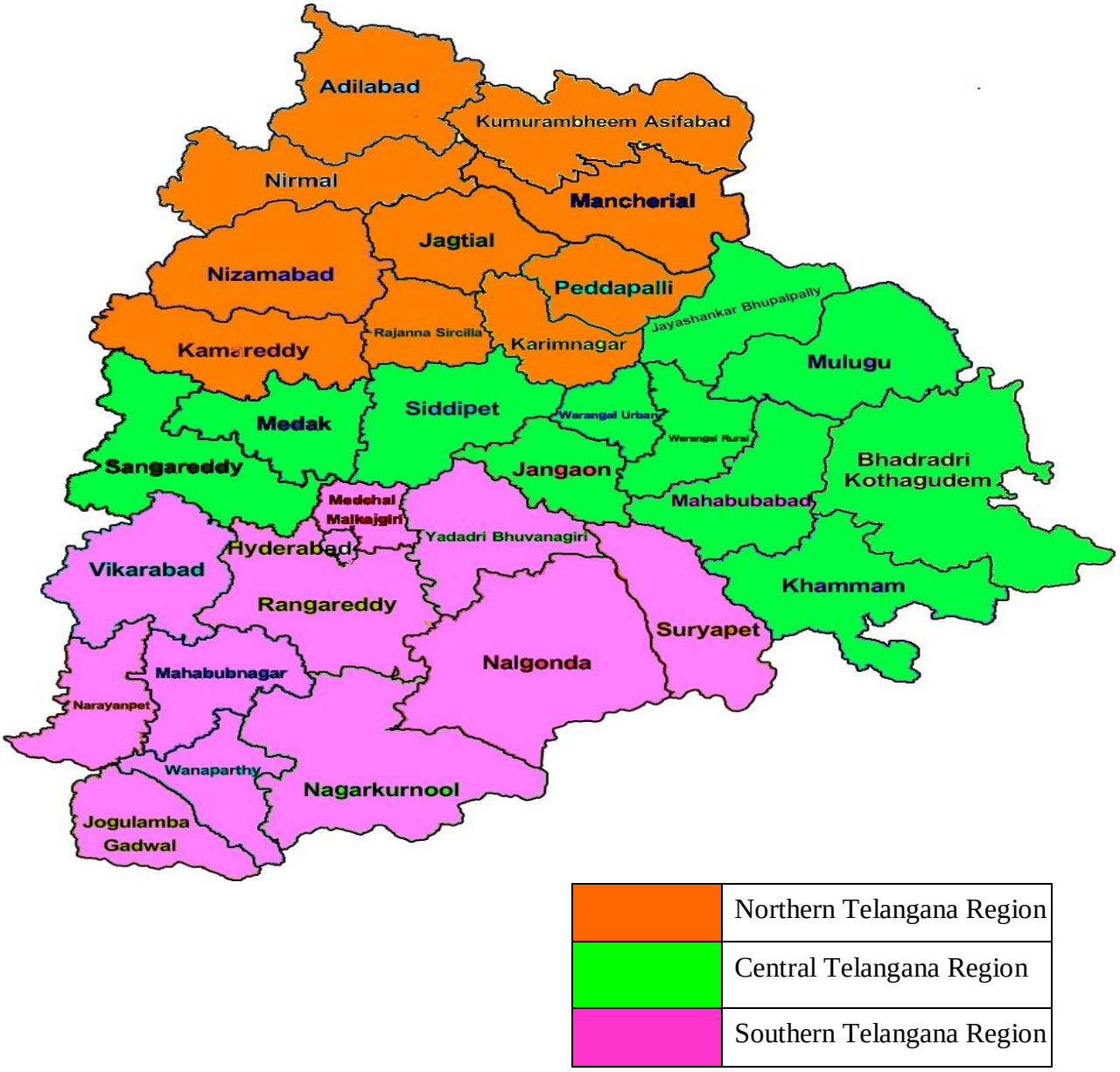
Description	Year 2011
Telangana State (TS) Population	3.50 Crores
Male	1.76 Crores
Female	1.73 Crores
TS sex ratio (Female per 1000 Males)	988 ratio
Density of population	312 per sq. km
TS Decadal growth rate (2001-2011)	13.58 percent
Rural population	2.13 Crores
Rural population male	1.07 Crores
Rural population female	1.06 Crores
Literates	2.06 Crores
Male literates	1.17 Crores
Female literates	0.89 Crores
Rate of literacy	66.54 Percent
Male literacy rate	75.04 Percent
Female literacy rate	57.99 Percent

Source: Census Report, Govt. of India, 2011

3.8.4 Agro-Climatic Zones of Telangana

The state is divided into three agro-climatic zones based on climatic parameters such as rainfall, soils, and cropping patterns. The study and recommendations of Prof. Jayashankar Telangana State Agriculture University (PJTSAU), the "Regional Agricultural Research Stations" set up within each zone are used to support agricultural planning for each zone.

Figure 3.3: Agro-climatic zones of Telangana state



Source: Agricultural Statistics at a Glance, Telangana 2015-16

Table 3.2 Telangana State Agro-climate Zones and their Characteristics

Sl. No	Zone	District	Rainfall	Temperature	Soil-type	Crops grown
1	Northern Telangana Zone	Rajanna Sircilla, Peddapally, Nizamabad, Nirmal, Komurambheem Asifabad, Karimnagar, Kamareddy, Jagityal Mancherial, and Adilabad.	900 mm to 1150 mm	21 ^{0} C to 25 ^{0} C&32 ^{0} C to 37 ^{0}	chalkas, Red soils, red sands Black soil and deep red loams.	Rice, Maize, Soya been, Cotton, Red gram, Turmeric.
2	Central Telangana Zone	Warangal (Urban and Rural), Siddipet, Sangareddy, Medak, Mahabubabad, Khammam, Jayashankar Bhupalpally, Jangaon, Bhadradri Kothagudem.	800 mm-1150 mm	21 ^{0} C to 25 ^{0} C & 22 ^{0} C to 37 ^{0} C	Red sandy soils and BC soils in pockets and Red earths with loamy soils (Chalkas).	Maize, Cotton, Green gram, Mango, Chilies, Rice.
3	Southern Telangana Zone	Yadadri Bhuvanagiri, Wanaparthy, Vikarabad, Suryapet, Rangareddy, Narayanpet, Nalgonda, Nagarkurnool, Medchal, Malkagiri, Mahabubnagar, Jogulamba Gadwal, Hyderabad.	600 mm - 780 mm	28 ^{0} C to 34 ^{0} C & 22 ^{0} C to 23 ^{0} C	Red soils chalks.	Cotton, Rice, Red gram, Maize, Green gram.

Source: Department of Agriculture, T.S.

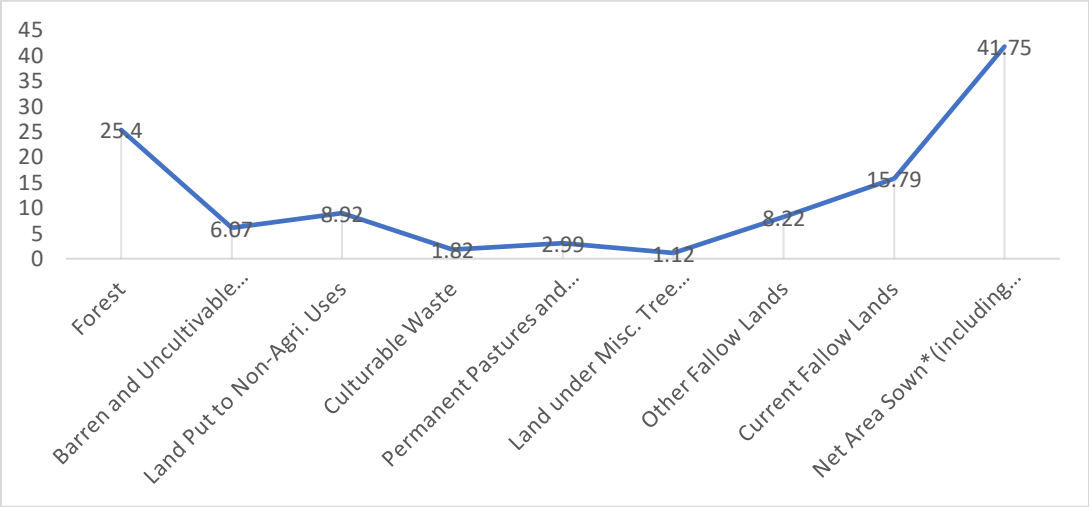
Northern Telangana includes the districts of Nizamabad, Karimnagar, and Adilabad. The annual rainfall ranges from 900 to 1150 millimeters, with the majority occurring during the south-west monsoon. During the south west monsoon, maximum and minimum temperatures range from 21 to 25 degrees Celsius and 32 to 37 degrees Celsius, respectively. The area is dominated by red soils such as chalkas, red sands, and deep red loams. The zone is distinguished by exceptionally deep black cotton soil.

The districts of Warangal, Medak, and Khammam cover Central Telangana, which receives an average annual rainfall of 800 to 1150 millimeters. During the south west monsoon, maximum and minimum temperatures range from 21 to 25 degrees Celsius and 22 to 37 degrees Celsius,

respectively. This region is dominated by red soils such as chalkas, red sands, and deep red loams. There is also a lot of thick black cotton soil in this region.

The Southern Telangana area includes the districts of Rangareddy, Hyderabad, Mahaboobnagar, and Nalgonda. The average annual rainfall is between 600 and 780 millimeters. The maximum and minimum temperatures during the south west monsoon vary from 23 degree Celsius to 33 degree Celsius. This zone is distinguished by a predominantly red soil tract with a loamy subsoil, i.e., chalkas.

Figure 3.4: Land Utilization in Telangana during 2015-16 (lakh ha).



Source: The Directorate of Economics and Statistics, T.S.

3.8.5 Land Utilization in Telangana

Figure 3.4 depicts Telangana state's land usage statistics. Telangana has a total land area of 112.08 lakh hectares. In India, it was ranked 12th. The forest cover occupies 25.40 lakh hectares, or 22.66 percent of the total land area. Around 37.25 percent of the total geographical area is under cultivation (41.75 lakh hectares), 14.09 percent is in existing fallow lands (15.79 lakh hectares), 7.96 percent is used for non-agricultural purposes (8.92 lakh hectares), 5.42 percent is barren and uncultivable (6.07 lakh ha).

3.8.6 Agriculture Performance of Telangana

Telangana's economy has been boosted by the agricultural and allied sector's impressive success (crops, livestock, fisheries, and forestry). The sector's real Gross State Value Added (GSVA) increased by an impressive 20.9 percent, the second highest rate since the state's inception. In comparison, the national growth rate of 3 percent is very low. This sector has changed at a 14.5 percent annual rate on average since 2016-17.The crop and livestock subsectors have been the primary drivers of this development, averaging annual growth rates of 17.1 percent and 13.9 percent, respectively, over this time. This is consistent with the Government's focus on agriculture and related sectors. Irrigation (via the Kaleshwaram project, Mission Kakatiya, and other irrigation projects) played a significant role in this rapid development. Additionally, the state has been lucky to receive favorable monsoons in 2016-17, 2019-20, and 2020-21 (Socio Economics Outlook, 2021)

Table 3.3: Agriculture Sector and Sub-sectors Contribution in GSDP of Telangana at Constant Prices 2011-12 (Rs in Crores)

Sector	Agriculture sector	Growth in AGS	Crops and Livestock	Growth in crops & Livestock	Forestry & Logging	Growth in forest & logging	Fishing & Aqua	Growth in fishing & aqua
2011-12	54615		51216		1917		1481	
2012-13	59434	0.08	55892	0.084	1906	-0.01	1636	0.09
2013-14	61792	0.04	58062	0.037	1858	-0.03	1872	0.13
2014-15	55811	-0.11	52065	-0.115	1715	-0.08	2031	0.08
2015-16	52348	-0.07	48858	-0.066	1683	-0.02	1808	-0.12
2016-17	58076	0.10	54950	0.111	1635	-0.03	1491	-0.21
2017-18	62086	0.06	58711	0.064	1636	0.00	1738	0.14

Source: The Directorate of Economics Statistics, TS.

Table 3.3 summarizes the contribution of agriculture and related sectors to Telangana State's Gross State Domestic Product (GSDP) at constant rates. The year-on-year growth rate is projected from 2011-12 to 2017-18.Agriculture's contribution to the state's gross domestic product, which includes all associated sectors, increased from 56615 crores in 2011-12 to 62086 crores in 2017-18. Similarly, over the same time period, the share of crops and livestock has

increased. Forestry and logging contributed 1636 crores to gross domestic product in 2016-17, up from 1917 crores in 2012-13. The fishing and aquaculture subsector increased the state's gross state product (GSDP) marginally, from 1481 crores in 2012-13 to 1738 crores in 2017-18.

Figure 3.5: Agriculture and allied sectors contribution to Telangana State GSDP at Constant Prices 2011-12 (in Percentage)

Source: Directorate of Economics Statistics, T.S.

Figure 3.5 explains the percentage of contribution of agriculture and allied sectors in Telangana state GSDP. The crops subsector contribution is negative i.e., -20.6 percent in 2014-15 along with the agriculture sector overall. The agriculture sector contribution to state GSDP was 8.8 percent in 2012-13; 4 percent in 2013-14; 10.90 percent in 2016-17 and it was 6.9 percent during 2017-18. The livestock subsector contribution to state GSDP has increased from 8 percent in 2012-13 to 10.4 percent in 2017-18. But the fishing and aquaculture contribution is around 10 percent during 2012-2018.

3.8.7 Rainfall in Telangana

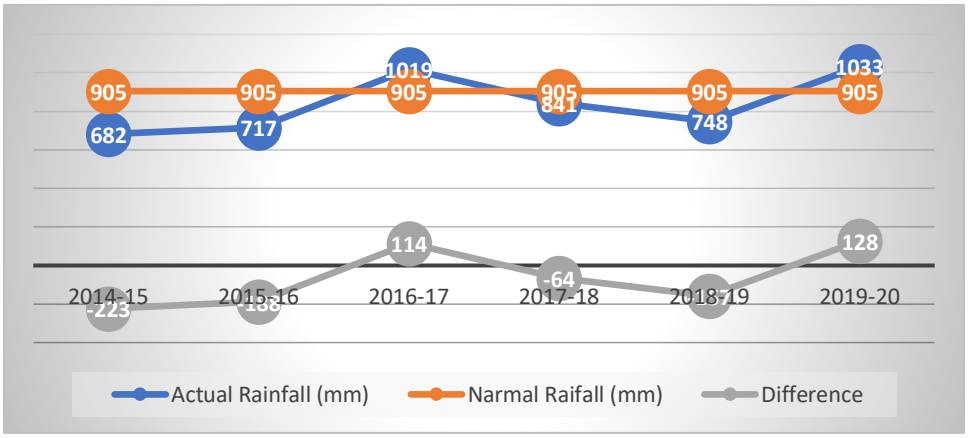
Telangana agriculture is reliant on rainfall, and agricultural production is dependent on rainfall distribution. The South-West monsoon has a significant influence. The South-West Monsoon (79 percent) occurs between June and September, the North-East Monsoon (14 percent), between October and December, and the remaining 7 percent occurs between winter and summer months. Telangana receives 905.3 millimeters of rain each year on average.

Table 3.4: Actual and Normal Rainfall in Telangana (Rainfall in mm)

Year	Actual Rainfall (mm)	Normal Rainfall (mm)	Difference (A-M)
2014-15	682	905	-223
2015-16	717	905	-188
2016-17	1019	905	114
2017-18	841	905	-64
2018-19	748	905	-157
2019-20	1033	905	128

Source: Directorate of Economics Statistics, TS

Figure 3.6: Rainfall Trend in Telangana State from 2014-15 to 2019-20



Source: Directorate of Economics Statistics, TS

3.9 Brief Profile of Nalgonda District

Nalgonda district has been selected in this study to find how there are differences among farmers on crop insurance-related aspects in two different ecosystems. This section covered the history, demographic information and agriculture features of the district.

3.9.1 History and Physical Features of Nalgonda District

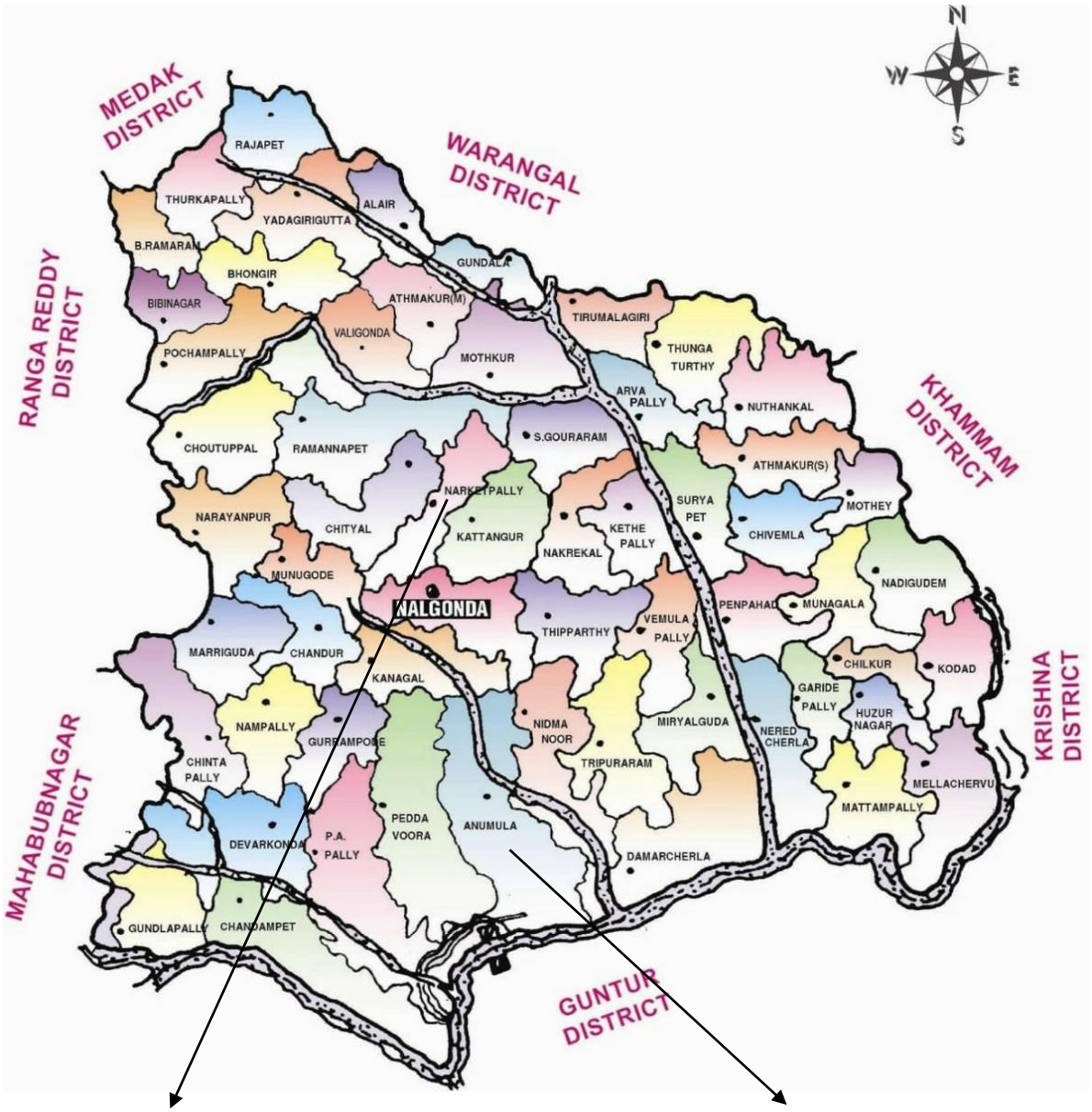
The district has developed as part of United Andhra Pradesh state since its formation on 1st November 1956. The name Nalgonda derives from two words in Telugu: Nalla (Black) and Konda (Hills) means black hills. This is also known as the hill of Neelagiri. The headquarters of the district is in the town of Nalgonda. This district is divided into four divisions, 59 mandals, and 1158 villages. This district is in the southern part of the Telangana division of United Andhra Pradesh. It is bounded on the north by the districts of Medak and Warangal, on the south by the districts of Guntur and Mahaboobnagar, on the east by the districts of Khammam and Krishna, and on the west by the districts of Mahabubnagar and Rangareddy. This district is approximately situated between 16°-25' and 17°-50' North latitude, and between 78°-40' and 80°-05' East longitude. The district covers 14,240 square kilometers and is part of the Krishna-Godavari agro-climatic region, with red soil, loamy sands, sandy lands, and sandy clay soils. The normal rainfall of the district was 744 mm and the actual rainfall during 2012 was 562 mm. There was a 182 mm rainfall deficit in 2012. The details of climate and soil types and temperature are mentioned in Table 3.5.

Table 3.5: Nalgonda as Part of Agro-climatic Zone

3	Southern Telangana Zone	Yadadri Bhuvanagiri, Wanaparthy, Vikarabad, Suryapet, Rangareddy, Narayanpet, Nalgonda, Nagarkurnool, Medchal, Malkagiri, Mahabubnagar, Jogulamba Gadwal, Hyderabad.	600 mm - 780 mm	28^0 C to 34^0 C & 22^0 C to 23^0 C	Red soils chalks.	Cotton, Rice, Red gram, Maize, Green gram.

Source: The Directorate of Economics and Statistics, Hyderabad, T.S.

Figure 3.7: Map of Nalgonda District in Telangana State



Narkatpally (study mandal, Rain-fed

Anumula (study mandal- Irrigated Area)

Figure 3.7 is a map of the Nalgonda district which comprises the study mandals. Narkatpally and Anumula are identified with an arrow mark and study villages were selected from these mandals.

3.9.2 Demographic Features of Nalgonda district

The 2011 Census explains that the district of Nalgonda has a population of 3,488,809, of which 1,759,772 and 1,729,037 were male and female, respectively. This district had a population of 32,48 lakhs according to the 2001 census, of which 16,52 lakhs were males and 15,96 lakhs were females. This district's population represented 4.12 percent of the total population of Maharashtra, with Census 2001 representing 4.26 percent of the population of Maharashtra. In 2001, there was a population-related decline of 7.41 million. The Nalgonda district recorded a 13.88 percent increase in its population compared to 1991 during the previous census of India in 2001. Table 3.6 describes the Nalgonda district's demographic details. 81.01 percent of the Nalgonda population belongs to rural areas and the remaining 18.99 percent live in urban areas.

Table 3.6: Nalgonda District Population Details (Census, 2011)

Description	2001	2011
Total Population (lakhs)	32.48	34.89
Male	16.52	17.60
Female	15.96	17.29
Population growth	13.88%	7.41%
Area Sq. Km	14.24	14.40
Density/km2	228	245
% of Andhra Pradesh population	4.26%	4.12%
Sex Ratio (female per 1000 males)	966	983
Child sex ratio (0-6 Age group)	952	923
Average literacy rate (%)	57.15	64.2
Total child population (0-6 Age) lakhs	4.56	3.72
Child proportion (0-6 Age)	14.04%	10.66%

Source: Census, 2011

3.9.3 Agriculture Sector Performance of Nalgonda District

This district is essentially an agricultural district with good irrigation sources with favorable climatic conditions. Agriculture and related practices employ approximately 70 percent of the population. Paddy, cotton, red gram, sugar cane and horticultural crops (sweet lemon juice and

lemon) are major crops grown in this district. For paddy and groundnut seed production, the climatic conditions are very friendly and for realizing seed production in the state in particular and India in general.

Table 3.7: Nalgonda's Details on Cropped and Irrigated Area (in Lakh ha)

Total geographical area	7.12
Gross cropped area	3.47
Net cropped area	3.12
Gross irrigated area	1.09
Net irrigated area	0.76

Source: The Directorate of Economics and Statistics, Hyderabad, T.S.

3.10 Brief Introduction of Study Villages

Two villages have been selected from Nalgonda district of Telangana region of United Andhra Pradesh. The village of Yellareddygudem belongs to the rain-fed ecosystem and Chelmareddygudem falls under an irrigated ecosystem. The details of these two villages are discussed in this section.

3.10.1 Yellareddygudem

Yellareddygudem is a major village in Narkatpally mandal in Nalgonda district, Telangana. This village is 16 kilometers from Nalgonda's district headquarters and 5 kilometers from Narketpally. It is bordered by Kattangoor mandal on the east, Nalgonda mandal on the south, Chityala mandal on the west, and Ramannapeta mandal on the north. Suryapet, Bhongir, Miryalaguda, and Devarakonda are cities close to Yellareddygudem.

3.10.2 Chelmareddygudem

Chelmareddygudem is one of the major villages in Anumula mandal, Nalgonda district, Telangana, India. This village is situated 50 KM away from the district headquarters of Nalgonda and 10KM away from its mandal headquarters, Anumula. It is surrounded by Peruru village in the east part, Anjaneyuluthanda village in the south part, Kottala is on the west side,

Nayudupalem towards the north. Anumula, Haliya, Nagarjuna Sagar and Miryalaguda are the nearby cities to this village.

3.10.3 General Household Information of Study Villages

The definition of 'household' given by NSSO 61st round was used the same in this study which defined "the household as a group of persons, closely related in blood relations, living together and usually having their meals in a kitchen." In this section, four categories of caste wise information have been elicited from the respondents.

Table 3.8: Category wise Household's Information

Community	Yellareddy gudem	% of HH	Chelmareddy gudem	% of HH
Scheduled Caste	14	6.51	33	15.35
Scheduled Tribe	5	2.33	34	15.81
Backward Class	112	52.09	136	63.26
Open Caste	84	39.07	12	5.58
Total	215	100.00	215	100.00

Source: Field Survey, 2016-17

3.10.4 Category-wise household information

Table 3.8 explains the category-wise household information of the study villages. Out of 215 farmers in Yellareddygudem, 52.09 percent of households belong to the backward classes, while 63.26 percent in Chelmareddygudem. The open caste of the Reddy community has the second highest percentage of people only in Yellareddygudem, with the lowest 5.58 percent in Chelmareddygudem. The Scheduled tribe and scheduled caste population in Chelmareddygudem village is around 15.50 percent and it is 2.33 percent and 6.51 percentage in Yellareddygudem.

3.10.5 Demographic Facts

The demographic particulars like age, gender, relationship with the head, education level, occupation and farming experience were collected. The age is given a scale of 1 for 0-25 years, 26-50 years equals to 2 and 3 above 50 years, while education is measured in terms of a scaling technique where 0 indicates illiterate, 1 for primary, 2 for high school and 3 for higher education. However, this can be calculated by the number of years spent in school and colleges. But an inherent loophole of this technique is that sometimes if someone spends more than one year in the same class, then it gets overestimated. So, the scaling technique is an appropriate one.

Table 3.9: Demographic Information of Sample Villages

Population	Yellareddy gudem	% of MP&FP to TP	Chelmareddy gudem	% of MP&FP to TP
Male	456	51.76	482	53.67
Female	428	48.58	414	46.10
Total	881	100.00	898	100.00

Source: Field Survey, 2016-17

Table 3.9 provides population statistics of two study villages. The total population of villages Yellareddygudem and Chelmareddygudem are 881 and 898 people respectively. Out of 881 people in Yellareddygudem, 51.76 percent of people are male and 48.58 percent are female, wherein Chelmareddygudem the male and female population are 53.67 and 46.10 respectively.

Table 3.10: Age Composition of Two Villages

Years	Chelmareddygudem				Yellareddygudem			
	FAge	% of FAge	FExp	% of FExp	FAge	% of FAge	FExp	% of FExp
00-25	7	3.26	88	40.93	16	7.44	57	26.51
25-50	125	58.14	111	51.63	120	55.81	91	42.33
Ab 50	83	38.60	16	7.44	79	36.74	67	31.16
Total	215	100.00	215	100.00	215	100.00	215	100.00

Source: Field Survey, 2016-17

Notes: Fage =Head farmer's age, FExp=farmer's experience in year

3.10.6 Age Composition and Farm Experience

Table 3.10 describes the head of the household age and farming experience. The majority of the farmers in these villages belong to the age group of 25 to 50 years, i.e., 58.14 percent in Chelmareddygudem and 42.33 percent in Yellareddygudem. Surprisingly, the irrigated ecosystem (Chelmareddygudem) had a lower participation rate, 3.26 percent, only among those under the age of 25, whereas the rain-fed ecosystem (Yellareddygudem) had a higher participation rate of 26.51 percent.

3.10.7 The Assets Facts of Households

Household assets are classified into three types: (a) fixed assets, (b) livestock, and (c) agricultural implements. Under the fixed asset category, we included mainly different types of houses like thatched, asbestos and concrete roofs, and then grain storage, pump sets, dug wells, tube wells, televisions, radios, cycles, and 2-wheelers and millers, etc. Under the category of livestock, we include bullocks, cows, buffalos, poultry, and sheep/goat. In the category of agricultural implements, we included types of plough like a wooden plough, steel plough, power tiller, bore-well, tractor, bullock cart, and sprayer, etc. The number of these assets, their year of construction or purchase, cost at the time of construction and purchase and their current value is recorded. However, it was very difficult for the farmer to price some of the items since in the rural area, the market for some of the items does not exist like the thatched house. However, other things can be estimated properly, though the farmer cannot price them properly. But, we did it after getting the market information and appropriate quantities were recorded.

3.10.8 Information on Climatic Damages and Coping Mechanisms

Under this section, we collected information on reasons for crop loss like different climatic risks like floods, drought (different types), cyclones, surplus rainfall, rainfall shortage, and weather-induced diseases, etc. Later on, the villager's risk mitigation tactics are also analysed. Farmers of these villages depend on off-farm activities like poultry, dairying, vegetable cultivation, sheep raring, etc. to cope with the risk and uncertainty in cultivation making activities. The farmers of rain-fed villages replied that they are ready to bear up to 30-50 percent of crop loss, but it is less than 20 percent only in the irrigated area. To get out of the crop loss in agriculture, farmers of

Yellareddygudem have been attending crop management classes organized by NGOs in and around them.

Table 3.11: Farmers' Perception on Rainfall in Sample Villages (in %)

Farmers' Perception on Rainfall during Last Three Years in Sample Villages		
Perception	Yellareddygudem	Chelmareddygudem
Adequate	58.60	68.84
Inadequate	7.44	8.37
Normal	28.37	19.07
Full Shortage	5.58	3.72

Source: Field Survey, 2016-17

Table 3.11 explains the farmers' perception of rainfall for the last three years in two of the sample villages. About 60 percent of the farmers in two villages felt rainfall during the last three years was adequate and 6 percent of the farmers felt rainfall was a shortage in Yellareddygudem, but it was 4 percent only in Chelmareddygudem village.

3.10.9 Beneficiaries under the Loan Waiver Scheme and Subsidies

We collected data on beneficiaries under the Andhra Pradesh and Telangana loan waiver scheme. This scheme has benefited the majority of farming communities. All these farmers are receiving subsidies on agriculture implements like tractors, ploughs, cultivators, and inputs from the state government, BC corporations and SC & ST corporations. Almost half of the farmers have benefited from the MGNREGS. These schemes are not directly related to agricultural development. However, the government has been spending a large amount on Mission Kakatiya, Kaleshwaram, and other projects for the provision of providing irrigation facilities to all the villages and Mission Bhagirath for the provision of drinking water to Telangana people. 100 percent of the farmers in sample villages were the beneficiaries under the loan waiver scheme.

3.10.10 Farm Income

Table 3.12 describes the average income and cost of cultivation of the farmers in two villages. The average farm income in a rain-fed village of 2.92 lakh rupees is higher than the irrigated area farm income of 2.11 lakhs. The component of livestock income has also been reported, namely 1.18 lakhs in Yellareddygudem and.74 lakhs in Chelmareddygudem.

Table 3.12: Sources of Income in Average

Sources of income	Yellareddygudem	Chelmareddygudem
Farm income	291339.30	211757.95
Livestock income	117316.14	74331.63
Income from fixed assets	1083529.07	737204.14
Total cost of cultivation	114082.33	91886.05

Source: Field Survey, 2016-17

The value of fixed assets in the rain-fed region is 10.84 lakhs on average, while it is 7.38 lakhs in the irrigated region. Finally, the cost of cultivation has also been reported higher in a rain-fed village, 1.15 lakhs than in the irrigated region, 0.92 lakhs.

3.10.11 Infrastructure Facilities

Under this section, we analysed the infrastructural facilities of the study villages and their availability to the farmers. It includes electricity and transport, credit facilities and accessibility, ownership of agricultural implements and irrigation facilities.

3.10.12 Transport Communication and Electricity

Both study villages have power, and they have been supplying electricity for agricultural and domestic purposes since 1990.Since these two villages are part of the newly formed state of Telangana, they have been providing 24-hours of electricity for all activities at subsidized rates since 2016. However, the use of power for agricultural purposes in irrigated villages is very low because canal irrigation is used, whereas it is high in rain-fed region villages because bore well and dug well irrigation require a large amount of electricity to pump the underground water. Two villages are connected by roadways and railways. Chelmareddygudem village is connected with the Anumula mandal with the panchayat raj road and Haliya with the Nagarjunasagar-Nalgonda highway. Yellareddygudem village is on the Addanki National highway road.

3.10.13 Agriculture Credit Facility and Accessibility

Agriculture credit sources of these two villages can be divided into two categories, namely institutional credit and non-institutional credit. Farmers of two study villages, Chelmareddygudem and Yellareddygudem approach the banks in and around Haliya, Anumula and Narkatpally, Nalgonda respectively. The commercial banks State Bank of India (SBI) and Andhra Bank (ANB), Regional Rural Banks Nagarjuna Garmin Bank and Primary Co-operative Banks of these banks provide credit facilities to the farmers along with their usual day to-day activities. The rate of interest on all institutional sources is more or less similar. In addition to the institutional credit, farmers of these villages also depend on friends, money lenders, commission agents. The interest rate varies from lender to lender, from borrower to borrower and it is also different for different amounts of money transacted.

Table 3.13 shows the various sources of agriculture credit for the purposes of agriculture production. It is found that the majority of farmers in these two villages depend upon institutional sources like commercial, co-operative, and regional rural banks. All farmers, nearly 100 percent of the villagers received loans from banks because of the loan waive scheme. Farmers subscribed to loans from non-institutional sources (23.40 percent) in Yellareddygudem village and 26.19 percent in Chelmareddygudem, in addition to institutional credit.

Table 3.13: Sources of Agriculture Credit

Sources of agriculture credit	Yellareddygudem	Chelmareddygudem
Commercial Banks	36.74	31.16
Regional Rural Banks	31.16	42.79
Co-operative Banks	32.09	26.05
Total Institutional Credit	100.00	100.00
Money lenders	6.50	10.70
Friends and relatives	4.50	3.33
Commission agents	10.10	7.98
Traders	2.30	4.19
Total non-institutional sources	23.4	26.19

Sources: Source: Field Survey, 2016-17

In Yellareddygudem village, 36.74 percent of farmers depend upon commercial banks for agriculture finance and it is the highest from institutional sources. But regional rural banks are providing the highest 42.79 percent of institutional credit. The rate of interest on institutional

credit is 7.5 percent to 9.5 percent or paisa (under the pavala vaddi scheme) and it is 20-25 percent under the non-institutional sources of agriculture credit.

When it comes to repayment methods and sources of repayment, farmers from two villages have expressed similar opinions. The loans will be renewed or repaid by farmers annually and agriculture produce and sale of jewellery are the sources for the repayment.

3.10.14 Ownership of Agricultural Implements

The agricultural implements include the wooden plough, steel plough, tractor, bullock cart and power sprayer. Ownership of these implements allows farmers to improve their economic position, even if some of them, such as wooden ploughs and bullock carts, are used in traditional modes of production, and it also identifies whether farmers are adopting modern techniques or not.

Table 3.14: Ownership of Agricultural Implements.

Sources of agriculture credit	Yellareddygudem	Chelmareddygudem
Buffalo	150.00	220.00
Bullock	68.00	80.00
Bullock carts	13.00	11.00
Wooden plough	193.00	163.00
Steel plough	35.00	15.00
Tractors	43.00	12.00
Pump sets	197.00	46.00
Power sprayers	210.00	152.00
Grain store	0	1.00

Source: Field Survey, 2016-17

Table 3.14 shows the ownership of agricultural implements in two villages. It has been observed that the two villagers' secondary occupation is dairying. The number of buffalos in Yellareddygudem and Chelmareddygudem villages are 120 and 220 respectively, tells the importance of dairying, but, in the irrigated region, the farmers use wooden ploughs where bullocks are required. The ownership of other agricultural implements, like bore wells, sprayers and so on, shows that farmers use sprayers more in irrigated regions and bore-wells are also found more in the irrigated region in comparison to rain-fed regions. Almost every household has a pump set and power sprayer in the rain-fed village, but the number of pump sets is less than

46 only in Chelmareddygudem. However, bullock carts and grain stores are almost similar in the two villages and wooden ploughs are still used in these villages.

3.10.15 Irrigation Facility

In Chelmareddygudem village, for irrigation, 76 percent of the farmers mainly depend upon the canal irrigation which is assured. Nearby this village there are tanks and Nagarjunasagar canal. Where canal irrigation does not reach, farmers depend on bore well and well irrigation, which is 14.42 percent and 1.86 percent respectively in the irrigated ecosystem.

Table 3.15: Sources of Irrigation

Land Details	Yellareddygudem	Chelmareddygudem
No irrigation	68.00	4.19
Canal irrigation	0.00	75.81
Bore well irrigation	27.35	14.42
Tank irrigation	1.40	3.72
Well irrigation	3.26	1.86
Total irrigation	100.00	100.00

Source: Field Survey, 2016-17

It is less than a percent, only 27.35 percent, of the irrigated land in the rain-fed area, with the remaining 68 percent relying on monsoon rainfall. Farmers initiate farming practice after receiving the monsoon rainfall. However, during the rainy season, a natural stream comes from the hill near the fields. During the test of time or seasons, there will be no irrigation and no cultivation take place. The bore well is very costly to dig.

3.10.16 Farm Size and Cultivation

Under this section, we analyse the average farm size holding, land types, and position of plots, cropping pattern, land ownership, and tenancy structure and finally, land distribution and inequality. These points are being studied under different sub-heads.

3.10.17 The Land Size Details

The land size details about their positions, soil quality, lease status, terms of the lease and the source of irrigation are collected from the respondents. The land is divided into two types of own land and leased land. Similarly, the soil quality has been assessed, and the land in these two study villages can be classified into two-three major types, namely, red soils, block soils, and mixed soils. This variable is scaled by putting 1 for block, 2 red and 3 for mixed. The same scaling technique is used to determine lease status, with 1 representing ownership, 2 representing lease in, 3 representing leased out, and so on. Terms of the lease also varied from one farmer to another within one location. It may take place as a 50-50 sharecropping where both parties share both costs and benefits equally. It might take place in the form of cash rent where a sharecropper just pays a certain amount of cash for a particular unit of land (per acre). In some cases, this kind of rent is also prevalent in the sense that the tenant gives a certain amount of produce after the harvest.

3.10.18 Land Position and Soil Quality

The land ownership, quality of soil and size of land are very important variables that determine the adoption and participation in crop insurance and risk reduction practices in the study villages. It is important to analyse the distribution of land concerning both parameters. Table 3.16 shows the distribution of total area into different land ownerships. Around 98 percent of the cultivable land is owned land in two villages and only 2 percent of the land is rented land in study regions. It is found that in the irrigated region the vast proportion of land belongs to medium and small categories. It is 79 percent and 13.49 respectively, but it is 37.21 percent and 48.37 percent in the rain-fed village.

The rest of the farmers of these two villages belong to a large farm category. It is 14.42 in Yellareddygudem and 7.91 in Chelmareddygudem village. In terms of soil nature and type, red soil was the most prevalent in both villages, accounting for 42 percent, followed by block soil (39%), and mixed soil (19%).

Table 3.16: Data on Land Size, Land Ownership and Land Quality (in %)

Land Details	Yellareddygudem	Chelmareddygudem
Own land	97.21	98.14
Rent land	2.79	1.86
1-4 acres land	48.37	78.60
5-10 acres land	37.21	13.49
10 acres above land	14.42	7.91
Black soil	39.53	38.60
Red soil	41.40	42.33
Mixed soil	19.07	19.07
Total	100.00	100.00

Source: Field Survey, 2016-17

3.10.19 Crops and Cropping Pattern

Crops grown in study villages fall into two broad categories: commercial crops and food crops. Rice is grown on a large scale (approximately 65 percent) in the irrigated ecosystem (Chelmareddygudem), but only on a small scale (20 percent) in the rain-fed ecosystem (Yellareddygudem). Cotton is the primary commercial crop in the rainfed ecosystem, having been grown in 70 percent of GCA and it is 25 in the irrigated ecosystem, and the remaining area occupies vegetable crops. Other crops are cultivated in limited quantities. In the irrigated area, rice, cotton, and a variety of vegetables such as potato, brinjal, tomato, green chili, cabbage, and cauliflower are grown. Pulses such as red gram and black grams are grown during the Kharif season in a rain-fed ecosystem.

3.12 Challenges in Primary Data Collection

In spite of devoted efforts to gather the information and statistics that portrayed the true situation, certain boundaries appeared to be unavoidable. Even though the study met its objectives and was completed, there were some unavoidable limitations, which are listed below:

- The main flaw in directly collecting information from respondents was convincing the beneficiaries to accept and spend time providing accurate and reliable information.

- We approached several village elders, Gram Panchayat Presidents, School Teachers, Village Revenue Officers, Agriculture Officers, and Panchayat Secretaries to explain the study's purpose and objectives in order to persuade the beneficiaries and obtain accurate data from respondents who believe us as researchers rather than government survey assistants. Meeting all these different sectors consumes a lot of time.
- The beneficiaries were not active and cooperative to provide information on their income and financial assets and cost of cultivation.
- The time consumed for collection of pertinent data from the beneficiaries on several aspects being mentioned in the questionnaire was more than 20 minutes and, as a consequence of that, it took time to elicit the information from the respondents of both selected villages.
- The questionnaire had to be translated into Telugu, the local vernacular language, in order to get information from the beneficiaries, which was an additional challenge for the researcher.
- Given the terrestrial blowout of the sample population, the cost of completing the study was high, and it was viewed as a major constraint on the part of the researcher to fund the same.
- Due to its remoteness and non-availability of the transport system, the author found it difficult to reach the villages selected for the study from the mandal headquarters.
- The researcher found it problematic to maintain a work-life balance because of having different family, social and official responsibilities. However, by taking periodic leave, I am prioritizing devoting an appropriate amount of time and ensuring the best efforts for the successful realization of my life's dream.

3.13 Summary

In this chapter, we gave a brief profile of United Andhra Pradesh including Telangana and discussed the selection of study district Nalgonda and the study villages at the final stage for the analysis of various issues related to crop insurance. These villages belong to two ecosystems, namely irrigated village and rain-fed village. The rationale for selecting the villages for the primary survey is also discussed. We then continued to the various characteristics of the district, a brief profile of two villages on a comparison basis which includes the demographic, socio-

economic and agrarian structure of the district economy and study villages. Finally, we discussed the demographic profile, irrigation facilities, average farm size, distribution of land holding, occupational structure, sources of income, inequality in the income distribution of sample villages and farmers. We also analysed the cropping pattern of sample villages where we observed that cultivation is dominated by rice and cotton in both regions. In the irrigated region, there are also some other crops being grown. But, in the rain-fed region, only rice is grown once a year in the Kharif season. Finally, the discussion about data collection and problems encountered during the field survey in general and for a specific variable, in particular, follows after that.

Chapter - 4
Performance of NAIS in United Andhra Pradesh and India

4.1 Introduction

The preceding chapter focused on a study of previous studies and identifying gaps in the crop insurance literature that prevented a comprehensive overview of the National Agriculture Insurance Scheme. As a result, the aim of this chapter is to assess the National Agriculture Insurance Scheme's (NAIS) performance in United Andhra Pradesh (UAP) in particular, and India in general, in terms of its coverage, successful implementation, financial performance, and effectiveness in managing risk and uncertainty in agriculture production. The time-series data for both the crop seasons, Kharif and Rabi, was used in this study from the year 2000-01 to 2013-14. This chapter also discusses the state of crop insurance in UAP and India, as well as recommendations for improving the efficiency of various crop insurance.

4.2 An Introduction to the National Agricultural Insurance Scheme (NAIS)

The "National Agricultural Insurance Scheme (NAIS)" is a government-sponsored risk management program in India that has been in operation in the country since the Rabi 1999-2000 season. In the event of crop failure due to natural disasters, catastrophes, pestilences, or diseases, farmers receive financial assistance. The Agriculture Insurance Company of India Limited serves as the Scheme's Implementing Agency at the moment.

Regardless of their land ownership, the initiative is open to all farmers, both loanee and non-loanee. All food crops (cereals, millets, and pulses), oilseeds, and annual commercial/horticultural crops for which yield data is available for a fair period of time are included in this category. For bajra, premium rates are 3.5 percent (of the insured amount) and 5% for oilseeds, 5% for other Kharif crops, 5% for wheat, and 5% for other Rabi crops, respectively. Commercial and horticultural crops are subject to actuarial costs. A subsidy of 10% of the premium is generally available to small and marginal farmers. They must pay a tax to the federal and state government that is split evenly.

This plan is focused on an Area Approach, which identifies specific areas for intervention. A particular block, tehsil, mandal, circle, or gram panchayat is allocated to each notified crop. The system currently includes 24 states and two union territories. Approximately 2919 lakhs of farmers have been protected during the last two decades of crop seasons (from Rabi 1999-2000 to Rabi 2011-2012). The scheme ensures a total of Rs 256065 crore and covers an area of approximately 256065 hectares. Approximately Rs. 25001 crores in claims have been paid or are due to be paid against the up to the Rabi 2011-12 campaigns, a premium of approximately Rs. 7565 crores will benefit approximately 518 lakh farmers (Operational Guidelines of NAIS, 2000).

4.2.1 Objectives of NAIS

According to the original document, important objectives of NAIS are:

- To provide farmers with insurance and financial assistance in the event of crop failure due to natural disasters, pests, or diseases.
- To encourage farmers to use environmentally friendly farming methods, high-value inputs, and advanced farming technology.
- To aid in the stabilization of farm revenues, especially in disaster years.

4.2.2 Prominent Features of the NAIS

Included crops: Food crops (cereals, millets, and pulses), oilseeds, sugarcane, cotton, and potato (commercial/horticultural harvests on an annual basis) are all covered by the schemes. For a three-year period, other annual commercial/annual horticultural products that depend on historical yield data will be hidden. In any case, the yields expected a year from now should be determined prior to the end of the previous year.

Affected states and farmers include: Both Indian states and union territories are covered by the scheme. States/UTs who want to participate in the Scheme must cover all crops that have been notified for coverage in that year. States and Union Territories would be expected to remain for three years if they were chosen for the initiative.

This program is available to all types of farmers. They are tenant farmers or sharecroppers who grow the notified crops in the notified areas. All farmers who grow notified crops and receive seasonal agricultural operations (SAO) loans from banks, referred to as Loanee Farmers, are required to participate in the Program, while all other farmers are optional or voluntary.

Flooding, inundation, and landslides, for example, will be covered by comprehensive hazard insurance to cover yield damages incurred by unforeseen hazards such as (I) natural fire and lightning, (ii) floods, hailstorms, cyclones, typhoons, tempests, hurricanes, and tornadoes, and (iii) flooding, inundation, and landslides. Misfortunes caused by war and nuclear accidents, intentional destruction, and other avoidable risks will be denied.

At the protected farmers' discretion, the Amount Insured (SI) can be expanded to provide an estimation of the assured harvest yield. In either case, a farmer may pay a premium at market rates to protect his commodity above the average limit yield amount of up to 150 percent of the normal yield in the specified region. If any loanee agriculturists were to appear, the Amount Insured would be at least equal to the measure of product advance growth. In addition, if an incident of loanee agriculturists occurs, the insurance premiums will be applied to the finance scale in order to secure an advance. The RBI/NABARD rules will bind in terms of crop loan disbursement methods.

Premium Rates and subsidies under the NAIS: The following (see Table 4.1) are the premium rates determined under the National Agriculture Insurance Scheme.

Table 4.1: Season-wise Premium Rates for Different Crops in NAIS in India

Season	Kharif		Rabi		Kharif and Rabi
Crop	Bajra and Oilseeds	Other crops (cereals, other millets and pulses)	Wheat	Other crops (other cereals, millets, pulses & oilseeds)	Annual Commercial Annual Horticultural crops
Rate of Premium	3.5 percent of Sum Insured or Actuarial rate decided, whichever is less	2.5 percent of Sum Insured or Actuarial rate decided, whichever is less	1.5 percent of Sum Insured or Actuarial rate decided, whichever is less	2.0 percent of Sum Insured or Actuarial rate decided, whichever is less	Actuarial rates

Source: Operational guidelines of NAIS and AICI Limited

The actuarial routine will be revised every five years if there was an epidemic of maize, millets, beats, or oilseeds. At the discretion of the State Government or the UTs, the actuarial rates will be related at the District/Region/State level. For small and marginal farmers, half or half of premium sponsorship is allowable, to be shared equally between the central government and the state or union territory governments. Following a review of financial performance and farmer reaction following the Scheme's first year of implementation, the premium subsidies are phased out over a three to five-year period.

Food crops and oilseeds receive a premium: The Implementing Agency (IA) and the Governments share the responsibility in the following proportions under the risk-sharing arrangement:

The government will cover more than 100% of the premium for the first five years after the transition to the actuarial system. For the next three years, IA will cover any ordinary case, that is, claims up to 150 percent of the premium, and claims greater than 150 percent will be paid out

of the Corpus Fund. IA can pay claims up to and including 200 percent of the corpus fund's cap after three years.

Annual commercial or annual horticultural crops premium: The Implementing Agency will bear all conventional misfortunes. For example, within the first three years, claims of up to 150 percent of premium are permitted, and after that, claims of up to 200 percent of premium are allowed, subject to the participation of attractive cases. The Corpus Fund would cover cases where the premium was levied at 150 percent for the first three years and 200 percent after that. However, after the first year of use, the three-year term set aside for this purpose will be assessed based on financial performance, and the duration can be extended to five years when fundamentals are taken into account. A Corpus Fund will be formed with 50:50 contributions from the Government of India and State/UT governments to resolve catastrophic misfortunes. The Corpus Fund commitment would be made with a part of the Calamity Relief Fund (CRF).
In the event of major calamities, the Scheme would be based on an Area Approach, with Defined Areas allocated for each notified crop, and on an individual basis in the event of limited catastrophes such as hailstorms, avalanches, violent wind, and surges. The State/UT Government may designate the Specified Area (i.e., the protected unit territory) as a Gram Panchayat, Mandal, Hobli, Circle, Phirka, Block, or Taluka. Taking an interest in the state/UT government, the Gram Panchayat dimension as a unit should be achieved within a period of three years. Individual-focused appraisals will begin in restricted zones on a trial basis in the event of restricted disasters, and will be extended based on operational experience acquired. The department will be supported by the district revenue authorities in conducting a loss survey.

Crop yield estimation: The state or union territory government will plan and conduct the appropriate number of Crop Cutting Experiments (CCEs) in the notified insurance units to assess crop yield for all informed or notified crops. For Crop Production and Crop Insurance purposes, the State/UT Government will continue to perform a single series of Crop Cutting Experiments (CCEs) and subsequent yield estimates. Crop Cutting Experiments (C.C.E.) will begin on the scale below, per unit area/per crop:

Table 4.2: List of Crop Cutting Experiments Conducted in NAIS in India

Unit area	Taluka/ Tehsil/Block	Mandal/Phirka/ any other smaller unit area comprising, 8 to 10 villages	Gram Panchayat comprising 4 to 5 villages
Minimum CCE	16	10	8

Source: Operational guidelines of NAIS and AICI Limited

Members of the N.S.S.O., the Ministry of Agriculture (G.O.I.), and the Implementing Agency make up the Technical Advisory Committee (T.A.C.) (IA). Its aim is to determine CCE sample size and other methodological issues.

Based on the coefficient of variation (C.V.) in yield data from the previous ten years, three indemnity levels will be expected for all crops (cereals, millets, pulses, oilseeds, and annual commercial/annual horticultural crops), namely 90%, 80%, and 60%. Insured farmers in a unit area, on the other hand, may choose to pay an additional premium based on actuarial rates in order to receive a higher level of indemnity. The Threshold yield (TY) or Guaranteed yield for a crop in an Insurance Unit is calculated by multiplying the indemnity sum by the moving average of the previous three years' average yield for rice and wheat, or five years' normal yield for other crops.

The extent of Indemnity and the essence of Coverage: All insured growers growing the crop in the notified area are considered to have suffered a yield shortfall if the 'Actual Yield' (AY) per hectare of the insured crop for the specified and defined area falls below the mentioned 'Threshold Yield' (TY) during the insured era. The Scheme aims to provide security in the event of such an incident. The term 'indemnity' will be described as follows:

*"Indemnity = Shortfall in Yield/ Threshold yield * Sum Insured for the farmer {Shortfall = 'Threshold Yield - Actual Yield' for the Defined Area}"*

According to NAIS Operational Guidelines "the loss calculation and modified indemnity measures in case of incidence of localized perils, such as hailstorm, landslides, cyclones, and floods where the settlement of claims will be on an individual basis, shall be expressed by IA in coordination with State/Union Territory Govt. The loss calculation of localized risks on an individual basis will be tested in limited areas, initially and shall be extended in the light of working experience gained. The District Revenue management will assist IA in measuring the amount of loss. Further, once the yield data is received from the State/UT Govt. as per the prescribed cut-off dates, claims will be worked out and settled by the Implementing Agency. The claim cheques along with claim details will be released to the individual Nodal Banks. The Banks at the grass-root level, in turn, should credit the accounts of the individual farmers and show the particulars of beneficiaries on their notice board. In the context of localized phenomenon, viz., hailstorms, landslides, cyclones and floods, the IA shall evolve a procedure to estimate such losses at individual farmer level in discussion with DAC/State/UT. Payment of such claims will be on an individual basis amongst IA and insured".

4.3 Data and Methodology

4.3.1 Data

The research relies solely on secondary data to examine the first goal. The time-series data on different variables such as gross cropped area, area covered, number of farmers covered, amount insured, gross premium, premium subsidy, claims initiated, and the number of farmers benefited under the National Agriculture Insurance Scheme was obtained from various published sources, including the Agriculture Insurance Company of India Ltd, Regional Office, Hyderabad, and the Directorate General of Agriculture, Agriculture Insurance Company of India Ltd, Regional Office, Hyderabad. The following statistical methods were used to assess the performance of crop insurance schemes in United Andhra Pradesh and India: Simple Percent (Straight-Line) Growth Rates, Compound Annual Growth Rates, and Ratios.

4.3.2 Methods Adopted

Percentage Growth Rate: The growth rate, which reveals the percent change from one period to the next, is calculated using the following formula:

$$GR = (PRV - PAV)/PAV * 100 \quad \text{..... (4.1)}$$

Where, GR = growth rate, PRV = present value and PAV = past value.

Compound Annual Growth Rate (CAGR): The CAGR is used to calculate the growth rate of a variable for a longer period of time. It can be calculated by the econometric model estimation. But we are applying direct formula here. Divide the value of a variable at the end of the period by its value at the start of the period, raise the result to the power of one divided by the period's length, and subtract one from the resulting value to get the compound annual growth rate. Multiplication by 100 will give value in percentage form. This can be written as:

$$CAGR = (EV/SV)^{1/N} - 1 \quad \text{..... (4.2)}$$

Where, CAGR= compound annual growth rate, EV= end value, SV= starting value and N = number of years

Ratio: To compare the variables, simple ratios have also been utilized. The ratio is a numerical comparison of any two or more numbers which specify their relative sizes. It can be measured as a way of relating numbers by division. In a ratio of two numbers, the first value is termed the antecedent and the second number is the consequent. It is expressed as:

$$CR = CVA/CVB \quad \text{..... (4.3)}$$

Where, CR = current ratio, CVA = current value of A, CVB = current value of B. Multiplication of a ratio by 100 will give its value in percentage form

4.4 Performance of NAIS in India

Taking into account the changes in the variables GCA (Gross Cropped Area), KA (Kharif Area), and RA (Rabi Area) to TAUNAIS, this chapter describes how farmers in India have engaged in and adopted crop insurance schemes (Total Area under NAIS). State and national time series data on the area covered by the scheme, the number of farmers insured, the amount guaranteed, premium received, claims paid, and the number of farmers benefited were analyzed in order to assess the implementation and performance of NAIS in United Andhra Pradesh and India.

Table 4.3: Percentage and Growth of Gross Cropped Area under NAIS in India (Kharif season and Rabi season), 2000 to 2014 (Area in '000 Ha)

Year	GCA	Area covered in Kharif	Area covered in Rabi	Total Area covered under NAIS	% the total area covered under NAIS to GCA	Growth rate of total area covered under NAIS
2000	185340	13219.83	780.57	14000.40	7.55	---
2001	188286	12887.71	3111.42	15999.13	8.50	14.28
2002	175580	15532.35	3145.87	18678.22	10.64	16.75
2003	190077	12355.51	4037.82	16393.34	8.62	-12.23
2004	191545	24273.39	6468.66	30742.06	16.05	87.53
2005	193316	20531.04	5343.24	25874.28	13.38	-15.83
2006	192491	19672.28	7218.42	26890.70	13.97	3.93
2007	195156	20754.75	7632.88	28387.63	14.55	5.57
2008	195357	17636.19	7387.16	25023.34	12.81	-11.85
2009	192197	25769.82	8857.84	34627.65	18.02	38.38
2010	197683	17108.73	7899.76	25008.49	12.65	-27.78
2011	195796	15773.20	6937.18	22710.38	11.60	-9.19
2012	194246	15693.70	7609.44	23303.14	12.00	2.61
2013	200950	14266.03	8691.16	22957.18	11.42	-1.48
2014	198360	6785.42	1717.31	8502.73	4.29	-62.96
CAGR	0.005	-0.043	0.054	-0.033	--	--
AAGR	0.005	-0.044	0.053	-0.033	--	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India

Table 4.3 shows the data of gross crop production under NAIS in India from 2000 to 2014 for both Kharif and Rabi. The area covered by NAIS as a percentage of GCA augmented from 7.55 percent to 16.05 percent in 2004 and 18.02 percent in 2009. It finally fell to 4.29 percent in 2014.There has been a higher percentage of areas covered by the scheme, with 18.02 percent recorded in 2009 and 16.05 percent recorded in 2004, with the lower percentage receiving 4.29 percent in 2014.The growth rate has increased in the year 2004 to 87.53 percent whereas there has been a decrease of -62.96, -27.78, -15.83, -12.23 in the years 2014, 2010, 2005, 2003 respectively. The CAGR and AAGR of 0.54 and 0.53 are higher in Kharif compared to Rabi. Thus, according to this table, there was a higher growth rate of 87.53 in 2004, whereas there was a higher fall in growth of -62.96 in 2014.

Table 4.4: Season-wise Growth Rate of Number of Farmers Protected in India Under NAIS In Kharif and Rabi Seasons from 2000 to 2014 (No. of farmers in '000)

Year	Rabi		Kharif	
	No. of Farmers Covered	Growth Rate of Farmers Covered	No. of Farmers Covered	Growth Rate of Farmers Covered
2000	579.94	---	8409.37	---
2001	2091.73	260.68	8696.59	3.42
2002	1955.43	-6.52	9768.71	12.33
2003	2326.81	18.99	7970.83	-18.40
2004	4421.29	90.01	12687.10	59.17
2005	3531.05	-20.14	12673.83	-0.10
2006	4048.52	14.66	12934.06	2.05
2007	4977.98	22.96	13398.82	3.59
2008	5044.02	1.33	12992.27	-3.03
2009	6210.65	23.13	18253.07	40.49
2010	5681.15	-8.53	12682.00	-30.52
2011	4967.41	-12.56	11553.85	-8.90
2012	5239.70	5.48	10649.35	-7.83
2013	6141.68	17.21	9722.16	-8.71
2014	1532.78	-75.04	7729.33	-20.50
CAGR	0.0719	--	-0.0060	--
AAGR	0.0694	--	-0.0060	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.4 explains the season-wise growth rate of many farmers covered in India under NAIS in Kharif and Rabi from 2000 to 2014. In the year 2000, 579.94 lakh farmers were covered under the scheme in Rabi, while 8409.37 lakh farmers were covered in Kharif. In the year 2001, the number of farmers covered increased to 2091.73 lakh, with a growth rate of 260.68 percent in the Rabi season, which decreased to-6.52 by the year 2002, while the growth rate for Kharif was 3.42 percent in 2001, which increased to 12.33 percent in the following year. Likewise, in the year 2004, the growth rate was 90.01 percent in Rabi, declined to-20.14 by the year 2005, while in Kharif the growth rate was 59.17 percent in the year 2004 and declined to-0.10 percent for the following year. In the years 2006 and 2007, the growth rate of the number of farmers covered under NAIS was positive for both seasons where the growth percent was higher in Rabi compared to Kharif. Further, the growth percent under NAIS has declined in the years 2010 and 2011 for both seasons. Rabi saw positive growth rates of 5.48 percent in 2012 and 17.21 percent in 2013, while Kharif saw growth rates of-7.83 and-8.71 percent, respectively. By the year 2014, the growth rates under the NAIS have decreased to-75.04 percent in Rabi, -20.50 percent in Kharif compared to the preceding year 2013. Rabi's CAGR and AAGR are 0.0719 percent and 0.0694 percent, respectively, while Kharif's CAGR and AAGR are-0.0060 percent and-0.0060 percent. Thus, this table explains that there are differences in covering the farmers under NAIS for Rabi and Kharif seasons. The coverage has been higher in Rabi compared to Kharif.

For the period 2000 to 2014, Table 4.5 shows the growth rate of the total number of growers covered by India's NAIS. The total number of farmers covered by the scheme in 2000 was 8989.31 lakhs, which rose by 20.013 percent the following year to 10788.32 lakhs in 2001.Whereas the number increased to 11724.14 lakh with 8.674 by the year 2002 with a 11.339 percent decline compared to the year 2001, where the total number decreased to 10297.64 lakh by the year 2003 with a -12.167 percent decline. The growth rate of total covered farmers under NAIS was higher in 2004 with 66.139 percent compared to other years, with a growth rate of 35.636 percent in 2009.There has been a greater fall in 2014 and 2010 years, with 41.615 percent and 24.937 percent, respectively, compared to other years, while the total number of farmers covered by NAIS is higher in 2009, with 24463.762 lakh. The CAGR is 0.93 percent whereas the

AAGR is none. Thus, this table shows that there are variations in covering the total number of farmers under NAIS between the years 2000 to 2014. In the year 2009, the number is higher whereas the growth rate was higher in the year 2001. There has been a greater fall in growth rate is noted in the years 2014 and 2010 compared to the preceding years.

Table 4.5: Growth Rate of Total Number of Growers under NAIS in India from 2000-2014 (No. of Farmers Covered in '000)

Year	Total Farmers Covered	Growth Rate of Farmers Covered
2000	8989.31	…
2001	10788.32	20.013
2002	11724.14	8.674
2003	10297.64	-12.167
2004	17108.39	66.139
2005	16204.88	-5.281
2006	16982.58	4.799
2007	18376.80	8.210
2008	18036.29	-1.853
2009	24463.72	35.636
2010	18363.14	-24.937
2011	16521.26	-10.030
2012	15889.06	-3.827
2013	15863.84	-0.159
2014	9262.12	-41.615
CAGR	-0.93	--
AAGR	0.00	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

For the period 2000 to 2014, Table 4.6 shows the percentage and growth rate of farmers who benefited from the NAIS in India for both crop seasons. In India, the percentage of farmers who benefited from NAIS during the Kharif season was 43.23 percent in 2000, 43.99 percent in 2002, and 43.67 percent in 2009. The number of farmers who profit from the remaining Kharif seasons ranges from 15% to 20%, and it is lower than 2.75 percent during the Kharif season of 2013. Since its inception in 2014, the percentage of farmers benefited under NAIS in the Rabi season

has been lower than in the Kharif seasons, according to the data in this table. During the Rabi seasons, the percentage of farmers who gained from NAIS was higher in 2004 and 2003, at 47.46 percent and 39.81 percent, respectively, and it was lower than 4.56 percent. During the Kharif seasons, the Compound Annual Growth Rate (CAGR) and Average Annual Growth Rate (AAGR) for the number of farmers benefited by NAIS were negative, but positive during the Rabi seasons.

Table 4.6: Season-wise Proportion of Growers Benefited under NAIS in India, 2000-2014

(No. of farmers covered and benefited in Lakhs)

	Kharif			Rabi		
Year	Farmers Covered	Farmers Benefited	% of Farmers Benefited	Farmers Covered	Farmers Benefitted	% of Farmers Benefited
2000	8409374	3635252	43.23	579940	55288	9.53
2001	8696587	1741906	20.03	2091733	526697	25.18
2002	9768711	4297155	43.99	1955431	453325	23.18
2003	7970830	1712270	21.48	2326811	926408	39.81
2004	12687104	2674743	21.08	4421287	2098125	47.46
2005	12673833	2686390	21.20	3531045	772779	21.89
2006	12934060	3131511	24.21	4048524	980748	24.22
2007	13398822	1591863	11.88	4977980	1391554	27.95
2008	12992272	4218975	32.47	5044016	1578668	31.30
2009	18253072	7970618	43.67	6210648	1979695	31.88
2010	12681995	2252617	17.76	5681148	1042753	18.35
2011	11553854	1844470	15.96	4967409	1137305	22.90
2012	10649354	1810161	17.00	5239701	1251385	23.88
2013	9722158	266902	2.75	6141677	802946	13.07
2014	7729333	..	0.00	1532784	69901	4.56
CAGR	-0.0060	-0.6601	--	0.0719	0.0169	--
AAGR	-0.0060	-1.0790	--	0.0694	0.0168	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.7: Percentage and Growth Rates of Total Farmers (both Kharif and Rabi) Benefited under NAIS in India, 2000-2014

(India's total farmers covered and benefited in Lakhs)

Year	Total Farmers Covered	Total Farmers Benefited	% of Total Farmers Benefited	Growth Rate of Farmers Benefited
2000	8989314	3690540	41.055	---
2001	10788320	2268603	21.028	-38.53
2002	11724142	4750480	40.519	109.40
2003	10297641	2638678	25.624	-44.45
2004	17108391	4772868	27.898	80.88
2005	16204878	3459169	21.346	-27.52
2006	16982584	4112259	24.215	18.88
2007	18376802	2983417	16.235	-27.45
2008	18036288	5797643	32.144	94.33
2009	24463720	9950313	40.674	71.63
2010	18363143	3295370	17.946	-66.88
2011	16521263	2981775	18.048	-9.52
2012	15889055	3061546	19.268	2.68
2013	15863835	1069848	6.744	-65.06
2014	9262117	69901	0.755	-93.47
CAGR	0.002	-0.247	-0.248	--
AAGR	0.002	-0.283	-0.285	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.7 shows the percentage and growth rate of total farmers (Kharif and Rabi seasons) who gained from NAIS between 2000 and 2014. In India, the percentage of total farmers benefited by NAIS was 41.55 percent in 2000, 40.67 percent in 2010, 40.51 percent in 2002, and a very poor 0.75 percent only in 2014. Growth rate of total farmers benefited under this scheme is higher than 109 percent in 2002 and it has reported positive in a few other years during 2004, 2006, 2008, 2009 and 2012, and during the remaining years, the growth rate of farmers is negative.

4.5 Financial Performance of NAIS in India

In order to analyze NAIS financial performance in United Andhra Pradesh and India, the claim-premium ratio has been calculated by dividing the insurance premium claim payment. If the claim premium ratio is more than one, the insurer in the crop insurance business will be shown a financial loss. A continuous increase in claim premium ratio of more than one indicates that farmers are benefiting from crop insurance schemes.

Table 4.8: Claim-premium Ratio in India under NAIS for Kharif and Rabi, 2000 to 2014

(All numbers in Rs '000 except ratio)

	Kharif			Rabi		
Year	Gross Premium	Claims Paid	Claim/Premium	Gross Premium	Claims Paid	Claim/Premium
2000	20673.55	122248.15	5.91	542.48	769.26	1.42
2001	26161.82	49363.57	1.89	2778.76	5948.63	2.14
2002	32546.68	182439.2	5.61	3014.79	6465.8	2.14
2003	28333.19	65268.12	2.30	3850.43	18854.84	4.90
2004	45894.28	103816.53	2.26	6405.87	49705.64	7.76
2005	44994.94	108503.03	2.41	7585.28	16058.6	2.12
2006	46729.14	177621.89	3.80	10482.4	33830.2	3.23
2007	52432.28	91448.4	1.74	14287.6	51597.41	3.61
2008	51194.35	237780.26	4.64	15871	81017.92	5.10
2009	86284.89	453744.28	5.26	29572.08	150848.72	5.10
2010	72178.42	164067.36	2.27	29170.48	39504.86	1.35
2011	71424.19	166315.27	2.33	29813.2	65721.07	2.20
2012	87874.18	58259.97	0.66	25767.81	36403.5	1.41
2013	97537.26	287239	2.94	44769.98	43.73	--
2014	51935.79	--	--	15636.13	1456.82	0.09
CAGR	0.068			0.271	0.047	
AAGR	0.066			0.240	0.046	

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.8 shows the claim premium ratio of India in both the crop seasons of Kharif and Rabi, where the claim premium ratio is more than 1 percent from 2000 to 2011, ranges from 1.74 percent to 5.91 in Kharif and 1.35 percent to 7.76 percent in Rabi. This causes a loss to the insurer in the insurance business and a benefit to the farmers as the percentage of claims has

been increasing. It is favorable to the insurer during the Kharif season of 2012 and 2014 that the CPR is below one percent, i.e., 0.66 and 0.00 respectively, which is a loss to the farmers. During the Rabi season, 2013 and 2014 have recorded below 1 percent CRP they are 0.00 and 0.09 respectively.

Table 4.9: Percentage of GCA under NAIS in United Andhra Pradesh (Kharif and Rabi) during 2000 to 2013

(Area in '000 Ha)

Year	GCA	Kharif Area	Rabi Area	Total Area	% of GCA to Area under NAIS	Growth rate of total Area Under NAIS
2000-01	13545	2391.78	314.79	2706.57	19.98	---
2001-02	12756	2331.45	310.10	2641.55	20.71	-2.40
2002-03	11559	2428.82	239.10	2667.92	23.08	1.00
2003-04	12366	2206.53	414.62	2621.14	21.20	-1.75
2004-05	12519	3692.38	399.11	4091.48	32.68	56.10
2005-06	13362	3403.04	397.52	3800.57	28.44	-7.11
2006-07	12811	3133.83	514.85	3648.68	28.48	-4.00
2007-08	13567	3477.31	388.02	3865.33	28.49	5.94
2008-09	13830	2851.46	788.43	3639.88	26.32	-5.83
2009-10	12560	4502.74	479.72	4982.46	39.67	36.89
2010-11	14512	3228.88	675.00	3903.87	26.90	-21.65
2011-12	13759	2328.57	910.68	3239.25	23.54	-17.02
2012-13	13650	1694.22	539.62	2233.84	16.37	-31.04
CAGR	0.0006	-0.026175	0.04233	-0.01466	--	--
AAGR	0.0006	-0.026524	0.041459	-0.01477	--	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

4.6 Performance of NAIS in United Andhra Pradesh

Table 4.9 shows the percentage of GCA under NAIS in United Andhra Pradesh from 2000 to 2013 for both Kharif and Rabi seasons. The gross cropped area was 13545 lakh hectors during 2000-01 and 13650 lakh hectors in the period 2012-13. The area covered under the NAIS in United Andhra Pradesh has been lower in Rabi in all the periods compared to Kharif. When

compared to other periods, the growth rate of the area covered by the NAIS is higher in 2004-05, at 56.10, and lower in 2012-13, at -31.04. The percentage of GCA to the total area covered under the NAIS has been high with 39.67 percent during 2009-10 and lower than 16.37 in the period 2012-13. Likewise, the percentage has been 19.98 percent in the period 2000-01 and 16.39 percent during 2012-13. The CAGR value of the gross cropped area in Kharif is not significant and is negative.

Table 4.10: Season-wise Growth rate of Number of Farmers Covered in United Andhra Pradesh under NAIS in Kharif and Rabi, 2000 to 2013.

(United AP Farmers in Lakhs)

Year	Kharif		Rabi	
	No. of Farmers Covered	Growth Rate of Farmers Covered	No. of Farmers Covered	Growth Rate of Farmers Covered
2000-01	1771.46	--	214.91	--
2001-02	1566.03	-11.60	209.70	-2.42
2002-03	1684.53	7.57	145.40	-30.66
2003-04	1501.82	-10.85	235.25	61.80
2004-05	2356.68	56.92	235.94	0.29
2005-06	1980.04	-15.98	267.50	13.37
2006-07	1964.83	-0.77	305.44	14.18
2007-08	2110.91	7.43	222.79	-27.06
2008-09	1706.01	-19.18	446.56	100.44
2009-10	3050.75	78.82	297.07	-33.48
2010-11	2192.50	-28.13	469.53	58.06
2011-12	1693.72	-22.75	553.75	17.94
2012-13	1204.40	-28.89	360.05	-34.98

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.10 depicts the season-wise growth rate of the number of farmers covered in United Andhra Pradesh under NAIS in the Kharif and Rabi seasons from 2000 to 2013. In the year 2000, the number of farmers covered under the scheme was 214.91 lakhs in the Rabi season, whereas the number of farmers covered was 1771.46 lakh in the Kharif season. In the year 2001, the number of farmers covered decreased to 1566.03 lakh, with a growth rate of -11.60 percent in

the Kharif season, whereas the growth rate decreased to -2.42 in the 2001 Rabi season, and further decreased to 30.66 percent in the 2002 Rabi season. The number of growers protected in NAIS in UAP during the Kharif season is higher than 3050.75 lakhs in 2009-10 and followed by 2356.68 lakhs in 2004-05. The rate of increase in the number of growers protected was also higher during the 2009-10 and 2004-05 Kharif seasons, at 78.82 percent and 56.92 percent, respectively, while the rate of increase in farmers was negative during the other years. Whereas in the Rabi seasons, the number of farmers covered was higher in 2008-09, followed by 235.25 lakhs in 2003-04, and lower negative in 2002-03, 2007-08, 2009-10, and 2012-13, with growth rates of 30.66 percent, 127.06 percent, -33.48 percent, and 34.98 percent, respectively.

Table 4.11: Growth Rate of Total Number of Growers Protected under NAIS in United Andhra Pradesh, 2000-01 to 2012-2013 (Number of farmers in Lakhs)

Year	Total No. of Farmers	Growth Rate of Farmers
2000-01	1986.37	…
2001-02	1775.73	-10.60
2002-03	1829.93	3.05
2003-04	1737.07	-5.07
2004-05	2592.62	49.25
2005-06	2247.54	-13.31
2006-07	2270.27	1.01
2007-08	2333.70	2.79
2008-09	2152.56	-7.76
2009-10	3347.81	55.53
2010-11	2662.03	-20.48
2011-12	2247.47	-15.57
2012-13	1564.45	-30.39

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.11 shows the annual growth rate of the total number of growers covered by the "National Agriculture Insurance Scheme (NAIS)" in Andhra Pradesh from 2000-01 to 2012-13. The growth percentages were 30.39, -20.48, -15.57, -13.31, and -10.60 in 2012-13, 2010-11, 2011-12, 2005-06, and 2001-02, respectively, while the total number of farmers covered by the scheme

was 3347.81 crore, with a growth percentage of 55.53 percent in 2009-10.The number of farmers covered in 2010-11 was 2662.03 lakh, up from 2592.62 lakh in 2004-05, with a growth rate of 49.25 percent in 2004-05 and a growth rate of -20.48 percent in 2010-11. There has been a continuous fall in growth rates during 2010-11, 2011-12, 2012-13 compared to 2009-10. Thus, this table shows that there has been a higher number of farmers covered under NAIS during the period 2009-10 with 3347.81 lakh and a continuous fall noted from the year 2010 to 2013.

Table 4.12: Percentage of Farmers Benefited Under NAIS in United Andhra Pradesh in Kharif and Rabi, 2000 To 2013.

United AP's Farmers Covered and Benefited in Lakhs

	Kharif			Rabi		
Year	Farmers Covered	Farmers Benefited	% of Farmers Benefited	Farmers Covered	Farmers Benefited	% of Farmers Benefited
2000-01	1771.46	125.52	7.09	214.91	27.46	12.78
2001-02	1566.03	288.03	18.39	209.70	15.38	7.33
2002-03	1684.53	641.73	38.10	145.40	40.32	27.73
2003-04	1501.82	271.44	18.07	235.25	47.27	20.09
2004-05	2356.68	285.55	12.12	235.94	27.88	11.82
2005-06	1980.04	661.60	33.41	267.50	10.45	3.91
2006-07	1964.83	638.77	32.51	305.44	40.59	13.29
2007-08	2110.91	14.13	0.67	222.79	10.73	4.82
2008-09	1706.01	759.53	44.52	446.56	50.46	11.30
2009-10	3050.75	1153.60	37.81	297.07	83.08	27.97
2010-11	2192.50	785.46	35.82	469.53	57.35	12.21
2011-12	1693.72	362.50	21.40	553.75	217.41	39.26
2012-13	1204.40	70.84	5.88	360.05	42.97	11.94
CAGR	-0.03	-0.04	--	0.04	0.04	--
AAGR	-0.03	-0.04	--	0.04	0.03	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.12 explores the percentage of growers profited under NAIS in the united Andhra Pradesh in Kharif and Rabi from 2000-01 to 2012-13. In the Kharif season, 44.52 percent of farmers benefited from the scheme in 2008-09, while in Rabi, 39.26 percent of farmers benefited from 2011-12, which was the highest percentage compared to other periods. Similarly, a total of 1153.60 lakh farmers benefited with 37.51 percent during 2009-10, while 14.13 lakh farmers

benefited with 0.67 percent during 2007-08, which is less than all other periods in the Kharif. During 2011-12, the higher number of farmers benefited with 217.41 lakh in Rabi, whereas the lesser number with 10.45 lakh was found during 2005-06 in the same season.

Table 4.13: Percentage and Growth Rates of Total Farmers Benefited under NAIS in United Andhra Pradesh, 2000-2013.

(United AP's Total Farmers Covered and Benefited in Lakhs)

Year	Total Farmers Covered	Total Farmers Benefited	% of Total Farmers Benefited	Growth Rate of Farmers Benefited
2000-01	1986.366	152.978	7.701	…
2001-02	1775.732	303.415	17.087	0.98
2002-03	1829.933	682.044	37.272	1.25
2003-04	1737.07	318.708	18.347	-0.53
2004-05	2592.621	313.435	12.090	-0.02
2005-06	2247.535	672.044	29.901	1.14
2006-07	2270.274	679.357	29.924	0.01
2007-08	2333.702	24.86	1.065	-0.96
2008-09	2152.563	809.993	37.629	31.58
2009-10	3347.813	1236.684	36.940	0.53
2010-11	2662.03	842.805	31.660	-0.32
2011-12	2247.473	579.914	25.803	-0.31
2012-13	1564.446	113.815	7.275	-0.80
CAGR	-0.018	-0.022	--	--
AAGR	-0.018	-0.023	--	--

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

Table 4.13 depicts the growth rate of farmers benefited and farmers are covered in the National Agriculture Insurance Scheme in United Andhra Pradesh. In the year 2000-2001, a total of 1986.36 lakh farmers benefited under the scheme and it has recorded the highest 3347.81 during 2009-10. By 2012-12 it has declined to 1564.47 lakhs. Whereas the total number of farmers benefited under this scheme has reported the highest 1236.68 lakhs in 2009-10 and the lowest 24.86 in 2007-08. Coming to the growth rates and percentage of farmers benefited, the highest

37.60 percent of farmers benefited in 2009-10, and the lowest 1.06 in 2006-07. Farmers benefited from a high growth rate of 31.58 percent in 2008-09, after being negative for six years.

Table 4.14: Claim-Premium Ratio under NAIS in United Andhra Pradesh during Kharif and Rabi Seasons, 2000-2013

(United AP Numbers in Rs '000 except ratio)

	Kharif			Rabi		
Year	Gross Premium	Claims Paid	Claim/Premium	Gross Premium	Claims Paid	Claim/Premium
2000	5.12	2.93	0.57	0.40	0.59	1.46
2001	5.04	8.76	1.74	0.41	0.12	0.30
2002	5.61	25.03	4.46	0.39	1.07	2.71
2003	5.42	20.04	3.70	0.67	1.46	2.18
2004	9.86	8.58	0.87	0.74	0.71	0.97
2005	9.80	49.45	5.04	0.92	0.36	0.39
2006	10.73	54.33	5.06	1.23	1.93	1.56
2007	12.88	0.73	0.06	1.05	0.42	0.40
2008	11.08	80.22	7.24	2.00	3.66	1.83
2009	20.91	69.95	3.35	1.73	3.24	1.88
2010	18.40	76.85	4.18	2.65	6.62	2.50
2011	14.31	24.95	1.74	4.27	15.86	3.71
2012	13.32	4.87	0.37	3.42	2.19	0.64
CAGR	0.08	0.04	-0.03	0.18	0.11	-0.06
AAGR	0.07	0.04	-0.03	0.16	0.10	-0.06

Source: Regional Office, AIC, Hyderabad, TS and MoA, Govt. of India.

4.7 Financial Performance of NAIS in United Andhra Pradesh

The financial progress of NAIS in United Andhra Pradesh is shown in Table 4.14. The claim-premium ratio was determined to assess NAIS financial results by separating the insurance claim or reimbursement payout from the insurance premium paid by the insurer. If the claim-premium ratio reaches one, it indicates that the insurer has incurred a monetary loss in the insurance market. During the 2000-2012 Kharif seasons, the claim-premium ratio was unfavorable, i.e., greater than one for nine years and favorable for only four, with the highest claims of 80.22 lakh recorded in 2008 and the lowest claims of 2.93 lakh reported in 2000.Likewise, the lowest claim-premium ratio is reported at 0.06 in the year 2007, whereas the highest was 7.24 in the year 2008. During 2000-2012, in rabi, the claim premium was favorable for 5 years whereas unfavorable for 7 years, while the highest claims of 15.86 lakhs have been reported in the year

2011 and the lowest was 0.12 lakh in the year 2001. The CAGR and AAGR during 2000-2012, the growth rate of gross premium rate was 0.08 percent and 0.07 respectively in Kharif whereas in Rabi it was 0.18 and 0.16 respectively.

4.8 Summary

In Chapter 4, we examined the performance of the National Agriculture Insurance Scheme at the national level and for the state of United Andhra Pradesh using secondary data obtained from AICIL, Regional Bank, Hyderabad Region. It also provides the framework for this chapter and the methodological methods used to analyze the data in the chapter. The data analysis and results are discussed in the chapter. The National Agriculture Insurance Scheme of 2000 was designed to make substantial improvements to crop insurance schemes that had been in place since the 1999-2000 Rabi seasons, with varying degrees of success. The Comprehensive Crop Insurance Scheme (CCIS) 1985, which offered insurance mandatorily to loanee farmers and voluntarily to non-loanee farmers to producers of small crops, was the immediate impetus for the reform. This insurance scheme was not effective in covering farmers and states. The overall number of ranchers covered had risen from 51.87 lakhs in 1994-1995 to 61.97 lakhs in 1998-1999. Furthermore, participation in CCIS programs remained very poor, with less than 1% of potentially insurable acreage enrolled, ranging from 82.44 lakh hectares in 1994-95 to 101.26 lakhs in 1998-99. In contrast, the experience under the 1994-95 Act has been frustrating, and although participation did not increase, the program's target of 50 percent participation was never met.

To address the issue of low farmer participation and coverage of the region under previous schemes, the National Agriculture Insurance Scheme appeared to be very appealing. The GOI proposed a standing disaster assistance program in the Ministry of Agriculture in 1999, which would include area-based payments to farmers at a cost roughly one-third that of the existing disaster schemes.

The region protected by NAIS as a percentage of GCA of India increased from 7.55 percent in 2000 to 16.05 percent in 2004, and it was reaching to a high share of 18.02 percent in 2009. Till 2013, the share in GCA for the country had been above 11% and it dropped to 4.29 percent for some reasons. The total absolute number of number of farmers covered by NAIS in India had

been increasing over time till 2013, with higher proportion during Kharif season than Rabi season in many years. In India, the percentage of total farmers benefited by NAIS was 41.55 percent in 2000, 40.67 percent in 2010, 40.51 percent in 2002, and a very poor (0.75 percent only) in 2014.

In all years during 2000-01 to 2012-13, the absolute area protected by the NAIS in United Andhra Pradesh has been lower in Rabi than in Kharif season. The share of area covered under the NAIS in GCA in United Andhra Pradesh was about 20% in 2000-01, which doubled to about 40% in 2009-10 and it marginally fell to 16% in 2012-13. In terms of number of farmers covered under the NAIS of UAP, Kharif season had been having higher number than Rabi season every year. For example, the number of farmers covered in NAIS in UAP during the Kharif season was 3050.75 lakhs in 2009-10 compared to 297.07 lakhs in Rabi season. The percentage of farmers benefitted under the NAIS scheme was the highest (44.52 percent) in 2008-09. During Rabi season, 39.26 percent of farmers was benefited in 2011-12 and it was higher compared to other periods in UAP.

Chapter - 5
Determinants of Farmers' Participation in NAIS: Evidence from UAP and India

5.1 Introduction

This chapter proceeds to examine the factors that influence farmers' participation in crop insurance in general, as well as the factors that influence farmers' participation in the National Agriculture Insurance Scheme in particular. It begins with a review of the definitions of public involvement in growth and welfare schemes, as well as farmer participation in crop insurance. In addition, we have discussed the data, methodology, and econometric methods used in this chapter. Finally, we have investigated the factors that influence farmers' involvement in crop insurance schemes.

The previous chapter has concentrated on the analysis of performance and development of various aspects related to crop insurance like the growth rate farmers covered, growth rate of area covered and its financial performance like growth rate of claims and growth rates of premium subsidies, etc. but how the farmers participation is determined and what are the important factors motivated or affected the farmers to participate in NAIS has not been studied. Therefore, this present chapter has focused on identifying the factors of farmers' participation in crop insurance by using the secondary data and panel econometric methods.

Participation is commonly used in common man debates on a daily basis. Surprisingly, this term transmits various meanings to various individuals. This section is devoted to a comprehensive discussion on this concept and its application to the subject of crop insurance in order to offer a good knowledge of its concept and remove vagueness on its meaning. The discussion includes the concept and method of participation, participatory considerations, the definition of farmer participation in crop insurance, and the determinants of farmer participation in crop insurance.

The International Labor Organization proposed the Basic Needs Approach (BNA) for growth and development in 1976, when it held its World Employment Conference. This method gives community engagement a complex role in policy making with attempts to improve living standards for people in developing countries (Nurick, 1985). Alamgir (1989) repeats it in the process of effectively alleviating poverty.

Importance must be positioned on the structure of popular organizations and public participation in project development from the beginning of the proposal phase onwards. It is this bottom-up method that can safeguard that projects are profitable, justifiable and, as practicality dictates, replicable, which confirms that the success of any development project or welfare scheme introduced by the government at the national and state level depends on the participation of the stakeholders of that welfare scheme and development project.

The importance of public institutions or organizations was also emphasized by Casley (1987). Development institutions therefore need to provide adequate support, both technically and financially, to mobilize and rearrange the current local authorities. He believes that such administrations can help to circulate information among the target people's group, support a scheme, raise cash resources or resources for accurate project activities, allocate agricultural inputs, distribute technical assistance among target groups, and collect the views, responses and interests of target groups to appropriate authorities.

An important acknowledgement of the importance of public participation is made by a gathering of United Nations officials. This group suggests independence as an alternative approach to overcoming the difficulties of poverty and dependence. This method would combine physical and intellectual resources to help solve the above-mentioned problems (UN, 1981).

Reliability correlated with the importance of including public involvement in development efforts. Heller (1991) describes five key participatory objectives. These goals include: advancing decision superiority, improving communication, increasing satisfaction, training assistants and subordinates, and facilitating transformation.

5.2 Definition of Public Participation

Generally speaking, the term participation is defined as the system in which the decision-making process includes two or more parties. Each member has equal power in decision-making to determine the outcome of the decisions.

In his research on public participation in development projects, Paul (1987) defines participation as an active procedure by which beneficiaries, stakeholders, or consumers influence the direction

and execution of a development scheme in order to improve their well-being in terms of income, individual growth, self-reliance, or other standards they value.

The United Nations group of experts also suggests a concept that is somewhat similar. We describe public participation as the creation of opportunities that enable all members of a community to contribute actively to and influence the process of development and to share the fruits of development equally. Nonetheless, according to Lisk (1985), bonafide community involvement can only be appreciated if it requires the poor sections of the population to participate fully and efficiently in decision-making.

Throughout their extensive debate on the definition and measure of public participation throughout rural development, Cohen and Uphoff (1977) clarified four types of public participation in the above examples. The forms of public participation include (l) public participation in decision-making, (2) public participation in the process, (3) public benefit participation, and (4) public participation in assessment and evaluation. In any rural development project, this designation also symbolizes a systematic program cycle.

In addition to the above-mentioned 'what' aspect of public participation, the researchers also address two other dimensions in their public participation context, the dimensions of 'who' and 'how.' In formulating a detailed and efficient model for common participation, understanding these two dimensions is essential.

As far as development schemes are concerned, the 'who' includes local dwellings, local leaders, administration staff and, where applicable, foreign or external people (for those schemes which receive assistance from foreign donor agencies). On the other hand, the 'how' dimension takes into account the basis of the public participation initiative, public participation incentives, structures, networks, time and scope of participation, and participation success. The UN expert group (1981) revealed another classification of public involvement based on the cause of involvement. They propose three types of public participation: (1) spontaneous public participation, the ideal type in which individuals participate spontaneously without external support; (2) induced public participation, the commonly occurring form of participation in which external parties encourage or empower people to participate; and (3) forced public participation,

which includes the parachute program. Lisk (1985) proposes four conditions in circumstances where public participation is low, which can promote a higher level of public participation. Situations include (1) decentralization of decision-making authorities and resources to local planning authorities, (2) adequate representation of local and senior decision-making bodies, (3) institution-building to enable wide-ranging public participation in decision-making, and (4) self-reliance on regional development. Although some people claim that public participation may delay the welfare plan or the implementation and development of projects, Oakley (1991) says that the other effect may be public participation. He assumes that in terms of productivity, efficiency, self-reliance, coverage, and sustainability, public participation can improve the implementation of development schemes.

5.3 Definition of Farmers' Participation in Crop Insurance

Crop insurance participation is described as the action of taking part in or being involved in crop insurance schemes by various stakeholders. Farmers are the main beneficiaries of these programs, which are designed to shield them from crop loss or failure in agricultural production.

Farmers' participation in crop insurance, according to Paul's (1987) concept of public participation in development projects, can be described as farmers actively participating in the decision-making process of purchasing crop insurance products to resolve the uncertainty in agriculture or crop loss listed in the scheme. To enhance their well-being in terms of income, personal development, self-sufficiency, or any other standards they desire.

Farmers' participation in Indian crop insurance schemes is expected for all loanee farmers, which means that all farmers who have earned crop loans from various banks must enter the crop insurance scheme. As a result, farmers' involvement in Indian crop insurance schemes is compulsory public participation, which requires some kind of coercive law that enforces necessary participation (Operational Guidelines of NAIS, 2000). This definition is an attempt to examine how crop insurance participation or involvement is calculated for farmers.

5.4 Methods of Farmers' Participation

In reply to the call for more active participation of the rural farming community in ensuring significant agriculture development of the National Agriculture Insurance Scheme, an evaluator meaningfully claimed that participation is more than simply receiving the benefit of the services that the crop insurance scheme offered. In contrast, people should be primarily interested in decision-making and ultimately responsible for leading events and actions beyond their farm boundaries (Cohen, 1987).

Identifying the importance of the involvement of farmers in insurance schemes, the next practical issue is how the vast farming community can improve their participation. The ultimate objective is to inspire farmers to partake in the planning of insurance schemes for switching and non-switching and to know the benefits of these schemes. Studies have shown that farmers' participation in crop insurance can be enhanced if they are directly involved in subscribing to crop insurance policies. Heck (1979) stated that an increasing number of participatory organizations had been formed in this regard. Farmers' participation in these has been extraordinary, owing to the fact that they were fully involved in the formation of the organizations and are now following these leads to meet their needs.

In most official organizations that are more proper and typically established by external or public sector agencies, it is problematic to secure dynamic participation of the rural in crop insurance schemes unless they are fully aware of the advantages of the schemes. In comparison, their participation in participatory rural organizations like the Small Farmers and Peasant Groups in Bangladesh, Nepal, and the Philippines is more important. Similarly, the farmers' participation is more in the US Multi-peril Crop Insurance Scheme (Barnett, 2000). According to Van Heck (1979), the characteristics of participatory rural organizations are: (1) they are established by individuals themselves and not by a government or other external agency; (2) they are more informal; (3) rural organizations are more flexible in their objectives; and (4) leaders and members are largely poor people who influence decisions in face-to-face transactions; and (5) their events are connected to day-to-day circumstances and requirements of the rural poor.

5.5 Data and Methodology

The second aim of the present research is to look into the factors that influence farmers' participation in the National Agriculture Insurance Scheme in both United Andhra Pradesh and India during the Kharif and Rabi crop seasons.

5.5.1 Secondary Data Sources and Study Period

To examine the above objective, the secondary data set was utilized, which was received from "Agriculture Insurance Company of India Limited", Regional Office, Hyderabad. The state-level balanced panel data is prepared for major states in India, which includes 12 major states, namely United Andhra Pradesh, Karnataka, Maharastra, Chattisgarh, Madhya Pradesh, West Bengal, Odisha, Uttar Pradesh, Jharkhand, Gujarat, and Assam In India. The state level balanced panel is prepared for both the crop seasons, namely Kharif and Rabi. The rationale for the selection of these major states is the availability of the secondary data and their performance in the crop insurance business in general and their performance in the National Agriculture Insurance Schemes. Similarly, the district level balanced panel data was also prepared for the selected districts in the united Andhra Pradesh. District level balanced panel is prepared both for the two crops, namely cotton unirrigated and paddy Rabi and Kharif seasons. The period of the study of data for the state level panel is from 2000-2012 and district-level data covers from 2004-2013 for both crop seasons, namely, Kharif and Rabi. The crop-wise NAIS data is not available for the major states in India and only aggregate performance of NAIS statistics is available, but crop-wise NAIS data is available for major districts in United Andhra Pradesh and district wise aggregate data is not available. Therefore, we have examined the determinants of farmers' participation in NAIS generally for the major states' aggregate NAIS data and crop-wise for districts in UAP. The balanced panel data is prepared for India's major 12 states and ten districts in United Andhra Pradesh.

5.5.2 Study Variables and Data Descriptions

Five variables were used, namely the number of farmers covered in NAIS is a dependent variable and Area insured, Sum insured, Total premium subsidy and Total claims are the regressors. The data on all these variables has been collected from AICIL and panel data has been prepared to analyze the above objective for the 12 major states, namely United Andhra Pradesh, Tamilnadu, Karnataka, Maharastra, Chattisgarh, Madhya Pradesh, West Bengal, Odisha, Uttar Pradesh, Jharkhand, Gujarat and Assam from India and 10 major districts namely Adilabad, Khammam, Medak, Nalgonda, Ranga Reddy, Guntur, Kadapa, Kurnool, Prakasam and Krishna from United Andhra Pradesh based on its performance in NAIS and the availability of data.

Table 5.1: Variables used in Chapter 5 and their types

S. No	Variable code	Variables	Type of score
1	NFC	Number of farmers covered in NAIS	Continuous
2	AI	Area insured under NAIS	Continuous
3	SI	Sum insured	Continuous
4	TPS	Total premium subsidy	Continuous
5	CA	Claim amount	Continuous

Source: Scholar's compilations

Table 5.2: List of States Selected from India

S. No	Name of the state
1	United Andhra Pradesh
2	Tamilnadu
3	Karnataka
4	Maharastra
5	Chattisgarh
6	Madhya Pradesh
7	West Bengal
8	Odisha
9	Uttar Pradesh
10	Jharkhand
11	Gujarat
12	Assam

Source: Scholar's own compilation

Table 5.1 shows that all of the variables used in this chapter are determined as specified in the table. They are continuous variables that include the number of farmers covered by NAIS, the region insured by NAIS, the amount insured, total premium subsidy, and total premium subsidy. Table 5.2 describes the states chosen in the analysis of farmers' participation in crop insurance from the country India, which represents the North and South India.

Table 5.3: List of Districts Selected from United Andhra Pradesh (UAP)

S. No	Name of the District	State
1	Adilabad	UAP
2	Khammam	UAP
3	Medak	UAP
4	Nalgonda	UAP
5	Ranga Reddy	UAP
6	Guntur	UAP
7	Kadapa	UAP
8	Kurnool	UAP
9	Prakasam	UAP
10	Krishna	UAP

Source: Scholar’s compilation

5.5.3 The Rationale for Selection of States and Districts

The above-mentioned states and districts were chosen because they have the best output in the National Agriculture Insurance Scheme in terms of the number of farmers covered, area covered, and claims. The second explanation for the selection is that these Indian states and districts in United Andhra Pradesh have been implementing the NAIS since its inception in 1999-2000. The final explanation is that the data is only accessible to those states and districts that want to prepare balanced panel data and study the factors that influence farmers' involvement in NAIS.

The functional form of the factors of farmers' participation in crop insurance of NAIS is specified as below.

"Number of farmers covered participation in NAIS= f (Area insured, Sum insured, Total premium subsidy, Total claims)".

5.6 Methodology

The panel data econometric models and tests utilized in the study are explained below.

5.6.1 Unit Root Test

Before the estimation of the panel model using the Random Effect method or any other panel model, there is a precondition to scrutinize the existence of unit roots for each possible variable. This is the reason that the data-set contains almost more than 100 observations. Besides, the Random Effect model assumes that the variables under the estimation are stationary (Maddala and Lahiri, 2009). As a result, before estimation can take place, study variables with the properties of I (1) (integration of order one) must be differenced (McCarl et al. 2008). There are many varieties of panel unit roots test methods available in the literature. Those are Im et al., (2003), Levin et al., (2002), Breitung, (2000) and Fisher-type test using ADF tests, etc. (Maddala and Wu, (1999). In the present study, we have used the Fisher type test using Augmented Dickey-Fuller (ADF) regression to estimate the panel unit-roots. This test is used because it produces more accurate results and has a higher power than other methods (Kunst et al. 2017). Moreover, it is a very user-friendly test for STATA software.

5.6.2 Fisher-type Test

For each cross-section i the Fisher-type panel unit root test employs probability values (p-values). Furthermore, the Fisher test formula is as follows:

$$P = -2\sum_{i=1}^{N} ln\, p_i$$

The Fisher test has 2N degrees of freedom and is asymptotically chi-square distributed (Ti —>1 for finite N). The primary advantage is that the test understands how to deal with unbalanced panels. Furthermore, the leg lengths of the individual augmented Dickey-Fuller tests are allowed to vary. Following the unit root test, we investigate the Random Effect Model and the Hausman test methodology.

5.6.3 Random Effect Model

The random effect model is a popular method for analyzing panel data (REM). STATA was used to run several regression models in order to match the equation below. The Hausman Specification test was used to examine the dilemma of choosing between random effect and fixed effect models. Using the results of the Hausman specification test, we discovered that the random effect model is the best fit for the sample.

The random-effects model can be specified as below:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon_{it}$$

Where,

Y_{it} = number of farmers covered under crop insurance
β_0 is constant
$\beta 1, \beta 2, \beta 3 \; and \; \beta 4$ are the coefficients of the independent variables
X_{1it} = Areas Insured
X_{2it} = Sum Insured
X_{3it} = Total Premium Subsidy
X_{4it} = Claim amount
ε_{it} = the error term

5.6.4 Why to use Random Effect Model

The random effects model (REM) is justified by the fact that, unlike the fixed effects model, variation between entities is supposed to be random and uncorrelated with the forecaster or independent variables used in the model: "the crucial distinction between fixed and random effects is if the unobserved individual effect embodies elements that are correlated with the

regressors in the model (Green, 2008, p.183). A random effect model must be used if there is reason to believe that unit variations have an effect on your dependent variable. The random effect model has the advantage of allowing time-invariant variables to be used (for instance, gender). The entity's error term variable is uncorrelated with the predictors that agree on the inclusion of time-invariant variables as independent variables in the random-effects model. You must decide which characteristics may or may not have an effect on the predictor variables in a random-effects study.

5.6.5 Hausman Test

The Hausman test is a widely used method for distinguishing between fixed and random effects (Hausman, 1978). The null hypothesis (H0) states that the random-effects model is preferred, while the alternative hypothesis (H1) states that the fixed-effects model is preferred (see Green, 2008). The specific errors (ui) are associated with the regressors in this test. They aren't, according to the null hypothesis. If the p-value is large in this test, one must run the fixed effects model. One must run the random-effects model if the p-value is not important. We discovered that the p-value is not meaningful in our sample, so we chose the random-effects model.

5.7 Factors Affecting farmers' Participation

The noble aim of promoting the participation of farmers is likely to fail unless, in formulating the participation strategy, great care is taken to examine factors that may influence participation. Farmers' involvement or participation in agricultural cooperatives, found that attitudes towards cooperatives and awareness of cooperatives are positively associated with participation (Nadarajah, 1982). These findings supported an earlier finding by Beal (1956) that found a positive relationship between cooperative knowledge and participation. Several factors influence farmers' crop insurance participation, and all of these variables influence and are linked to the dependent variable farmers' crop insurance participation.

The very small number of farmers who will be able to pay premiums, i.e., their pro-rata shares of losses, makes crop insurance or any other farm insurance difficult to engage in most developing countries. It is essential, therefore, that insurance should be organized in such a way as to keep premiums down to the minimum. One way of doing it would be to set the level of protection low

enough to cover only farmers' actual costs. This, however, would necessarily imply low protection for the vast majority of farmers and may not be very attractive to them. For such countries, the principal means of keeping premium costs low while making the insurance programme attractive to the average farmer would be for the Government to bear not only the expenses of administration but also part of the losses over a specified minimum. An alternative way would be to guarantee minimum automatic or compulsory insurance for all farmers with the government partly subsidizing the premium; the optional additional cover can be had by those farmers who want it but at full cost of the additional risk involved.

Crop insurance in developing countries is also hampered by a scarcity of appropriately trained staff, especially at the local or village level. This problem, however, may not be equally serious for all countries. For example, in a country where there is a piece of extensive machinery for the computation and collection of land revenue (land tax), the knowledge and experience, as well as other resources available, could be utilized for crop insurance policies. The problem of crop insurance experts and administrators at the national level could initially be met by asking for technical advisers first from multilateral organizations such as FAO, and second from countries like the United States, Canada or Japan, which have already accumulated some experience in the operation of crop insurance, and a third, a cadre of local officers could be built up by means of special short-term training held at both national and international level under the sponsorship of the interested national governments as well as of multilateral and bilateral agencies.

The initiation of crop insurance, as already observed, will require, at least in the initial stages, considerable financial support from governments. But the revenue resources accessible in most countries are severely limited and may be mainly committed to financing other programmes of economic development. The need for the crop or other agricultural insurance, therefore, is likely to be overlooked.

5.8 Results and Discussions

Under this section, the panel regression results are discussed along with the summary statistics of the data used for the panel data regression models.

Table 5.4: Kharif NAIS summery statistics for state level panel of India

Variable	Observations	Mean	Std. Dev.	Min	Max
NFC	156	875514.1	717033.6	1	3453000
AI	156	1290726	1157808	1	4900000
SI	156	935060.4	1043573	1	6065110
TPS	156	91030.71	222800.4	1	2190570
CA	156	2942.115	5872.771	1	56000

Source: Scholar's Estimation

The above Table 4.4 reveals the summary statistics of the Kharif state-level balance panel for India. The average value of the number of growers protected by NAIS is 875514.1 lakh crores, with a standard deviation of 717033.6 lakh crores. Similarly, the average area insured under the NAIS is 1290726 hectors and its standard deviation is observed as 1157808 hectors. The average sum insured and mean of total premium subsidies are reported as 935060.4 and 91030.71 crores respectively and its deviation is found as 1043573 crores and 222800 crores respectively. Where the average claims are low, that is 2942.16 crores only and its standard deviation is reported as 5872.78 crores. Since the NAIS scheme was changed to MNAIS in 2012, the data shows that the minimum value is 1.

Table 5.5: Rabi NAIS Summary Statistics for India

Variable	Observations	Mean	Std. Dev.	Min	Max
NFC	156	319674.1	392598.2	137	1986120
AI	156	471081.8	700890.1	54	4304660
SI	156	452291	804046.7	54	5719790
TPS	156	3339.066	11342.42	1	97400
CA	156	41095.5	116173.3	.09	898970

Source: Scholar's Estimation

Table 5.5 discloses the summary statistics of the Rabi state-level balance panel for India. It is observed that the mean value of the number of farmers covered in NAIS is 319674.2 lakh crores and its standard deviation is reported as 392598.2 lakh crores. Correspondingly, the average area insured under the NAIS is 471081.8 hectors and its standard deviation is observed as 700890 hectors. The average sum insured and mean of total premium subsidies are reported as 452291 and 3339 crores respectively and its deviation is found as 804046 crores and 11342 crores respectively. Where the average claims is lower than the sum insured, that is 41095.5 crores only and its standard deviation is reported as 116173 crores. The minimum value is found as 1 in data because the NAIS scheme was modified from the year 2012 onwards as MNAIS. The minimum value of the number of farmers covered in NAIS, area insured, the sum insured, total premium subsidy and claims are reported as 137 crores, 54 hectors, 54 lakhs, 1 core, and 0.9 crores respectively.

5.8.1 Unit root Test of State Level Panel of India for Kharif season

The data is tested with the panel unit root to find the stationarity to avoid spurious regression results. For this, we have employed the Augmented Dickey-Fuller Fisher type panel unit root test. All five variables have been tested for stationarity.

Table 5.6: Unit root Test Results NAIS-Kharif (Using Fisher type ADF Test)

Variable	At level			At First Difference			Inference
	I	I&T	None	I	I&T	None	
NFC	39.46**	48.92*	1909	137.17*	108.74*	174.60*	I (0)
AI	45.95*	51.50*	16.06	133.46*	97.83*	195.71*	I (0)
SI	14.58	17.85	9.33	82.45*	74.08*	96.63*	I (1)
TPS	22.72	13.92	26.14	55.90*	69.23*	97.44*	I (1)
CA	59.39*	58.18*	48.32*	144.45*	103.20*	206.78*	I (0)

Source: Scholar's Estimation

Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

The three variables NFC, AI, and CA are found to be stationary at level and the others SI and TPS are found to be stationary at first difference (Table 5.6). Hence the order of integration of the variables is NFC I (0), AI I (O), CA I (0), SI I (1), TPS I (1). All the variables are found to be significant at 1% and 5% level.

Table 5.7: Hausman Test Results for NAIS in India Rabi and Kharif

Kharif NAIS		Rabi NAIS	
Chi2 (4)	Prob>Chi2	Chi2 (4)	Prob>Chi2
3.17	0.5293	9.33	0.0535
H_0	Accept	H_0	Accept

Source: Scholar's Estimation

The null hypothesis is agreed based on the Hausman Test results for both seasons (Table 5.7). As a result, we proceed to study the Random Effects Model using the Hausman Test methodology. The Fixed Effects Model Results for Robustness are also presented.

Table 5.8: Random Effect Model of Major States of India (Kharif Season)

NFC	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
AI	.4228814	.037939	11.15	0.000*	.3485223	.4972404
SI	.0895764	.0311437	2.88	0.004*	.0285358	.150617
TPS	1.320957	3.489735	0.38	0.705	-5.518797	8.160711
CA	.0760989	.1066908	0.71	0.476	-.1330113	.2852091
_cons	235117.2	102837.7	2.29	0.022**	33558.91	436675.5
Model sum						
R^2 (Overall)	0.6154					
Wald chi2(4)	232.83					
Prob > chi2	0.0000					

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

Table 5.9: Fixed Effect Model of Major States of India (Kharif Season)

NFC	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
AI	.4142687	.0396078	10.46	0.000*	.335962	.4925754
SI	.0978781	.0307046	3.19	0.002*	.0371736	.1585827
TPS	.4917002	3.406281	0.14	0.885	-6.242701	7.226102
CA	.0829833	.1042047	0.80	0.427	-.1230351	.2890017
_cons	240284.2	48085.12	5.00	0.000*	145217.3	335351
Model sum						
R^2 (Overall)	0.6112					
F (4,140)	53.70					
Prob > F	0.0000					

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

For the Kharif season, the random-effects model for the major Indian states has been checked in Table 5.9. The R^2 and Wald statistics provide the effects of fixed effect dummies, which are used to monitor the impact of unobserved variables. The R^2 values in the current output are 0.61, indicating that the model recommended by the Zero probability is overall significant. The two variables, AI and SI, are statistically significant at the 1% level, indicating that the number of farmers protected by the National Agricultural Scheme is increasing. Despite the fact that TPS and CA have a positive effect on the number of farmers covered, neither variable is statistically important. The findings show that as the size of the insured area and the amount insured grows, so does the number of farmers who are protected. The results of the fixed-effects model are also included in the table, which demonstrates the robustness of the random-effects model.

5.8.2 Unit root Test of the State-level panel of India for Rabi season

The data is tested with the panel unit root to find the stationarity to avoid spurious regression results. For this, we have employed the Augmented Dickey-Fuller Fisher type panel unit root test. All five variables have been tested for stationarity. At first difference, all four variables NFC, AI, SI, and TPS are found to be stationary, and the other variable CA is found to be stationary at level (Table 5.10). All the variables are found to be stationary at 1% level of significance.

Table 5.10: Unit Root Test Results NAIS-Rabi- India (Using Fisher type ADF test)

Variable	At level			At First Difference			Inference
	I	I&T	None	I	I&T	None	
NFC	28.29	31.16	31.89	97.75*	72.59*	159.27*	I (1)
AI	31.00	37.62**	29.56	106.40*	74.21*	153.79	I (1)
SI	21.04	24.17	35.57	71.77*	51.43*	110.84*	I (1)
TPS	18.33	19.63	36.22	84.14*	70.67*	132.72*	I (1)
CA	51.95*	50.36*	46.09*	112.29*	79.41*	176.08*	I (0)

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

Table 5.11: Random Effect Model of Major States of India (Rabi Season)

NFC	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
AI	.4773941	.0303246	15.74	0.000*	.4179589	.5368293
SI	.0761836	.0192075	3.97	0.000*	.0385376	.1138296
TPS	2.908488	.8556873	3.40	0.001*	1.231372	4.585604
CA	.1751369	.089702	1.95	0.051**	-.0006759	.3509496
_cons	43416.38	31076.38	1.40	0.162	-17492.21	104325
Model sum						
R^2 (Overall)	0.8513					
Wald chi2(4)	1333.62					
Prob > chi2	0.0000					

Table 5.12: Fixed Effect Model of Major States of India (Rabi Season)

NFC	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
AI	.512473	.031893	16.7	0.000*	.4494189	.5755271
SI	.0623947	.0189432	3.29	0.001*	.0249431	.0998464
TPS	2.843731	.8224167	3.46	0.001*	1.217769	4.469693
CA	.1661856	.0867047	1.92	0.057**	-.0052342	.3376054
_cons	33711.98	11443.57	2.95	0.004*	11087.44	56336.53
Model sum						
R^2 (Overall)	0.8452					
F (4,140)	340.21					
Prob > F	0.0000					

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

The random-effects model for the Rabi season has been checked in Table 5.11 for the major Indian states. The results of the fixed effect dummies, which are only used to monitor the impact of the unobserved variables, are included in the R^2 and Wald statistics. The R^2 value of 85.13 is more than sufficient to recommend the overall significance of the chosen model. Later on, the zero-probability value is used to back it up.

The three variables Area Insured, Amount Insured, and Overall Premium Subsidy all have a positive effect on the total number of farmers protected by the national agricultural insurance scheme, as seen in the above results. The amount of the argument appears to have a positive impact on the number of farmers covered, although this is not statistically important. The results of the fixed effect model are also shown in the table, confirming the robustness.

Table 5.13: Rabi Paddy NAIS District Level Panel Summery Statistics for UAP (Major Districts)

Variable	Observations	Mean	Std. Dev.	Min	Max
NFC	100	8843.32	11689.52	313.00	71557.00
AI	100	14341.23	19946.86	723.20	127104.90
SI	100	3030000.00	5020000.00	3422300.00	3110000000.00
TPS	100	761095.70	2198893.00	3859.20	17100000.00
CA	100	4625571.00	187000.00	0.00	167000000.00

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

5.8.3 Determinants of Farmers Participation in NAIS in UAP for Paddy and Cotton Crops

Table 5.13 provides summary statistics of the Rabi season district level balance panel of paddy crop for United Andhra Pradesh. It is observed that the mean value of the number of farmers covered in NAIS is 8843.32 lakhs and its standard deviation is reported as 11689.52 lakh crores. The average area insured under the NAIS is 14341.23 hectors and its standard deviation is observed as 19946.86 hectors. The average sum insured and mean of total premium subsidies are reported as 30.30 crores and 761095 lakhs respectively and its deviation is found as 502000 lakhs and 2198893 lakhs respectively, wherein the average claims is low that is 4625571 lakhs only and its standard deviation is reported as 187000 lakhs.

Table 5.14: Kharif Paddy NAIS District Level Panel Summary Statistics for UAP (Major Districts)

Variable	Observations	Mean	Std. Dev.	Min	Max
NFC	100	34847.67	27687.79	4928	116092
AI	100	51613.36	36999.53	6327.48	165053.2
SI	100	9360000	8300000	1200000	3950000000
TPS	100	5955877	288000	208233.1	229000000
CA	100	385000	1220000	0	1020000000

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

Table 5.14 provides summary statistics of the Kharif season district level balance panel of paddy crop for United Andhra Pradesh. It is observed that the mean value of the number of growers protected in NAIS is 34847 lakhs and its standard deviation is reported as 27687 lakh crores. The average area insured under the NAIS is 51613 hectors and its standard deviation is observed as 36999 hectors. The average sum insured and mean of total premium subsidies are reported as 93.60 lakhs and 59.56 lakhs respectively and its deviation is found as 83.00 lakhs and 2.88 lakhs respectively, where the average claims is low that is 385000 lakhs only and its standard deviation is reported as 1220000 lakhs.

Table 5.15: Kharif Cotton Unirrigated NAIS District Level Panel Summary Statistics for UAP (Major Districts)

Variable	Observations	Mean	Std. Dev.	Min	Max
NFC	100	4824.13	6189.525	2	35271
AI	100	7565.013	10557.14	3.98	59806.15
SI	100	1160000	1570000	70000	902000000
TPS	100	687567.8	925578.5	0	4752735
CA	100	2600620	137000	0	127000000

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

Table 5.15 reveals summary statistics of the Kharif district level balance panel of the unirrigated cotton crop for United Andhra Pradesh. The average value of the number of growers protected by NAIS is 4824.13 lakh crores, with a standard deviation of 6189 lakhs. Likewise, the average area insured under the NAIS is 7565 hectors and its standard deviation is observed as 10557 hectors. The average sum insured and mean of total premium subsidies are reported as 1160000 and 687567 lakhs respectively and its deviation is found as 1570000 lakhs and 925578 lakhs respectively. However, the average claim is only 2600620 lakhs, with a standard deviation of 137000 lakhs.

Table 5.16: Unit root test results for Cotton (Unirrigated) (using Fisher type ADF test)

Variable	At level			At First Difference			Inference
	I	I&T	None	I	I&T	None	
NFCCUI	55.15*	51.34*	54.64*	69.52*	39.17*	116.79*	I (0)
AI	41.09*	40.26*	58.19*	62.67*	35.08**	112.33*	I (0)
SI	25.99	24.17	34.92**	52.64*	48.86*	97.75*	I (1)
TPS	24.18	16.85	28.40	50.32*	49.34*	84.03*	I (1)
CA	36.16*	21.52	61.37*	49.00*	37.99*	85.11*	I (0)

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

5.8.4 United Andhra Pradesh District Level Unit Root Results

From results in Table 5.16 of the unit root test, the three variables NFCCUI, AI, and CA are found to be integrated in order I (0) and they are stationary at level. The other two variables, SI and TPS, are found to be stationary at first difference. Hence, the null hypothesis is rejected at 1% and 5% level of significance respectively.

Table 5.17: Unit root Test Results for Paddy-Kharif (Using Fisher type ADF test)

Variable	At level			At First Difference			Inference
	I	I&T	None	I	I&T	None	
NFCPK	46.37*	41.36*	25.20	82.77*	43.38*	139.80*	I (0)
AI	57.84*	57.32*	36.20**	96.73*	69.64*	159.42*	I (0)
SI	21.16	34.55**	5.27	65.89*	43.33*	97.27*	I (0)
TPS	8.21	20.57	9.94	38.84*	22.54	79.21*	I (1)
CA	70.01*	52.98*	73.04*	90.60*	69.61*	161.40	I (0)

Source: Scholar's Estimation

Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

The above Table 5.17 shows the unit root test results of the Paddy-Kharif season. Out of the 5 variables, the four NFCPK, AI, SI, and CA are found to be stationary at the level. TPS, unlike the other remaining variables, is found to be integrated of I (1), implying that it is stationary at the first difference. Hence, the order of the four variables NFCPK, AI, SI, and CA is I (0). In all the 5 variables, the null hypothesis is being rejected at 1% and 5% levels, showing that the variables are stationary without the presence of unit-root.

Table 5.18: Unit Root Test Results for Paddy-Rabi (using Fisher type ADF test)

Variable	At level			At First Difference			Inference
	I	I&T	None	I	I&T	None	
NFCPR	25.85	28.37	18.01	66.65*	55.74*	115.44*	I (1)
AI	33.25**	35.12**	17.81	71.73*	53.90*	115.99*	I (0)
SI	15.71	28.41	14.31	64.38*	57.65*	84.06*	I (1)
TPS	12.61	31.88**	12.32	66.43*	50.17*	100.19*	I (1)
CA	72.58*	66.85*	87.47*	8847*	62.09*	136.46*	I (0)

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

In the Table 5.18, the unit root test results of the Paddy crop of the Rabi season in India are shown. To ensure the stationarity of the data, the above test results show that the variables AI and CA are degree I (0), i.e., they are sound to be stationary at the level and the other variables NFCPR, SI and TPS are found to be of degree I (1), i.e., stationary at first difference.

Table 5.19: Hausman Test Results for NAIS in UAP Rabi and Kharif

Paddy -Rabi NAIS		Paddy - Kharif NAIS		Cotton Unirrigated Kharif NAIS	
Chi2 (4)	Prob>Chi2	Chi2 (4)	Prob>Chi2	Chi2 (4)	Prob>Chi2
5.15	0.1618	24.21	0.0000	3.65	0.3017
H_0	Accept	H_0	Reject	H_0	Accept

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

The null hypothesis is agreed based on the Hausman Test results for both seasons (Table 5.19). As a consequence, we use the Hausman Test approach to study the Random Effects Model. The Fixed Effects Model Results for Robustness are also presented.

The random-effects model for United Andhra Pradesh was checked for the Rabi season in Table 5.20. The results of the fixed effect dummies, which govern the impact of the unobserved variables, are included in the R^2 and Wald statistics. The R^2 value is 95.08, indicating that the model is fine. The meaning and sturdiness are confirmed by Wald statistics and Zero-probability.

Table 5.20: Random Effect Model NAIS UAP (Paddy Rabi Season)

NFC	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
AI	.4602137	.033572	13.71	0.000*	.3944137	.5260137
SI	3.26e-06	1.23e-06	2.64	0.008*	8.43e-07	5.68e-06
TPS	-.0000869	.0001145	-0.76	0.448	-.0003113	.0001375
CA	.0000387	.0000132	2.94	0.003*	.0000129	.0000645
_cons	1155.618	428.0874	2.70	0.007*	316.582	1994.654
Model sum						
R^2 (Overall)	0.9511					
Wald chi2(4)	1627.67					
Prob > chi2	0.0000					

Source: Scholar's Estimation
Notes: * indicates significant at 1 % level and ** at 5 % level respectively.

Table 5.21: Fixed Effect Model of NAIS of UAP (Paddy Rabi Season)

NFC	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
AI	.4077606	.0376974	10.82	0.000*	.3328082	.482713
SI	4.15e-06	1.10e-06	3.77	0.000*	1.96e-06	6.34e-06
TPS	-.0001402	.0000991	-1.41	0.161	-.0003373	.0000569
CA	.0000378	.0000115	3.29	0.001*	.000015	.0000607
_cons	1692.849	341.9091	4.95	0.000*	1013.042	2372.656
Model sum						
R^2 (Overall)	0.9508					
F (4,140)	336.85					
Prob > F	0.0000					

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

5.8.5 Determinants of Farmers' Participation in NAIS for Paddy in Rabi Season in UAP

The three variables, Area Insured, Sum Insured and the Claim Amount positively affect the number of farmers covered and are significant at 1% level. The other variable, Total Premium Subsidy, negatively affects the number of farmers covered, but it is not statistically significant and hence it can be ignored. Further, apart from the random effects, the fixed effect model also reconfirms the robustness.

The random-effects model for United Andhra Pradesh has been checked for the Kharif Paddy in the Table 5.22. The results of the fixed effect dummies, which govern the impact of the unobserved variables, are included in the R^2 and Wald statistics.

Table 5.22: Random effect model of NAIS, UAP (Paddy Kharif Season)

NFC	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
AI	.4343188	.0354592	12.25	0.000*	.3648199	.5038176
SI	9.16e-06	1.50e-06	6.11	0.000*	6.22e-06	.0000121
TPS	.0000731	.0000317	2.31	0.021**	.000011	.0001352
CA	6.13e-06	6.06e-06	1.01	0.311	-5.74e-06	.000018
_cons	3190.816	2451.694	1.30	0.193	-1614.417	7996.049
Model sum						
R^2 (Overall)	0.8990					
Wald chi2(4)	330.14					
Prob > chi2	0.0000					

Source: Scholar's Estimation

Table 5.23: Fixed Effect Model of NAIS, UAP (Paddy Kharif Season)

NFC	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
AI	.3472386	.039043	8.89	0.000*	.2696237	.4248535
SI	8.08e-06	1.39e-06	5.82	0.000*	5.32e-06	.0000108
TPS	.0000485	.0000289	1.68	0.098	-9.05e-06	.000106
CA	7.00e-07	5.56e-06	0.13	0.900	-.0000104	.0000118
_cons	9045.772	2275.437	3.98	0.000*	4522.354	13569.19
Model sum						
R^2 (Overall)	0.8947					
F (4,140)	36.91					
Prob > F	0.0000					

Source: Scholar's Estimation

Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

5.8.6 Determinants of Farmers' Participation in NAIS Kharif Paddy crop during Kharif Season in UAP

The R^2 value is 89.90, which shows the goodness of significance of the model selected. The higher Wald statistics with the zero-probability value and also the fixed effects results prove the robustness of the model. In the results (Table 5.23), the three variables Area Insured, Sum Insured and the Total Premium Subsidy are found to be positively impacting the number of farmers covered and also the P-value is statistically significant. Whereas the other variable claim amount is positively affecting but not statistically significant.

5.8.7 Determinants of Farmers' Participation in NAIS for Cotton Crop Unirrigated in Kharif Season in UAP

From the results in Table 5.24, which studies the Cotton Unirrigated Kharif of the united Andhra Pradesh in the above Random Effects model, the R2 value is 95.49, which confirms the good significance of the model. The other part, the Wald Chi2 statistics and the zero-probability value also ensures the robustness of the model which is selected.

Table 5.24: Random Effect Model of NAIS, UAP (Cotton Unirrigated Kharif Season)

NFC	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
AI	.4353364	.0192176	22.65	0.000*	.3976706	.4730022
SI	.0000116	1.83e-06	6.34	0.000*	7.99e-06	.0000151
TPS	-.0000657	.0002517	-0.26	0.794	-.0005591	.0004277
CA	.0000161	9.89e-06	1.62	0.104	-3.33e-06	.0000354
_cons	191.7295	174.9924	1.10	0.273	-151.2493	534.7082
Model sum						
R^2 (Overall)	0.9549					
Wald chi2(4)	2010.02					
Prob > chi2	0.0000					

Source: Scholar's Estimation

Table 5.25: Fixed Effect Model of NAIS, UAP (Cotton Unirrigated Kharif Season)

NFC	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
AI	.4670491	.0261667	17.85	0.000*	.4150315	.5190668
SI	.0000102	2.09e-06	4.89	0.000*	6.08e-06	.0000144
TPS	-.00007	.0002763	-0.25	0.801	-.0006192	.0004793
CA	.0000147	.0000102	1.45	0.151	-5.47e-06	.0000349
_cons	111.9976	186.8595	0.60	0.551	-259.4668	483.4621
Model sum						
R^2 (Overall)	0.9541					
F (4,140)	356.32					
Prob > F	0.0000					

Source: Scholar's Estimation
Notes: * and ** represents 1 % and ** at 5 % level significant respectively.

Out of four variables in the study, two had a positive effect on the number of farmers insured. The two variables with a 1% degree of significance are the region insured and the amount insured, while the third variable, Total Premium Subsidy, has a negative effect but is not important. The final variable, claim amount, has a positive effect on the number of covered farmers but is not statistically important.

5.9 Summary

This chapter 5 on the "Determinants of Farmers' Participation in NAIS" began by analyzing the theoretical background of crop insurance participation and its determinants at the India level in general, and in United Andhra Pradesh (including Telangana) in particular. The study used secondary data on the variables included in the analysis. The secondary data set was obtained from the AICIL regional branch of Hyderabad from the period 1999-2000 to 2012-13. The data obtained is prepared as a balanced panel comprising the major states panel at India level and major districts in the United Andhra Pradesh level. This chapter adopted the econometric estimation of Probit model. The number of farmers covered in NAIS or farmers' participation in crop insurance which is a dependent variable. Area covered, the sum insured premium subsidies, and claims reported are the independent variables in the study. Later on, the econometrics methods used in the study were discussed, like the panel regression model and the necessary testing procedure for identifying the factors of farmers' participation in crop insurance policies. The results and findings of this chapter have been presented below.

- The two variables, Area Insured (AI) and Sum Insured (SI), are significant at 1% level which are positively affecting the number of farmers' participation in NAIS (National Agricultural Insurance Scheme) for the major states panel in India during the Kharif season. Even though TPS (Total premium subsidy) and CA (Claim amount) are positively impacting the number of farmers covered, both variables are found to be not statistically significant.
- The results show that as the Area which is insured and the Sum Insured increase, the Number of growers participated in NAIS gets positively impacted by this for India during Kharif season.
- It is observed that the three variables, Area Insured, Sum Insured, and the Total Premium Subsidy, are positively impacting the total number of growers protected or participated in the NAIS. The claim amount is also seen positively affecting the number of farmers covered but it is not statistically significant for major states panel during the Rabi season.
- In UAP (Undivided Andhra Pradesh), for Paddy crop districts panel for Rabi season, three variables (Area Insured, Sum Insured and the Claim Amount) are positively affecting the number of farmers covered and are significant at 1% level. The other variable (i.e., Total Premium Subsidy) is negatively affecting the number of farmers covered but it is not statistically significant and hence it can be ignored. Further, apart from the random effects model, the fixed effect model also reconfirms the robustness.
- Similarly, for Paddy crop districts panel for Kharif season in UAP, three variables (Area Insured, Sum Insured and the Total Premium Subsidy) are found to be positively impacting the Number of Farmers covered and also the P-value is statistically significant. However, claim amount is positively affecting but not statistically significant.
- The two variables (Area insured and the Sum insured) are significant at 1% level. The other variable (Total Premium Subsidy) is found to be having a negative impact but it is not significant. The last variable (Claim amount) is found to be positively impacting the number of farmers covered but it is not statistically significant for the cotton crop during the Kharif season in UAP.

Chapter - 6
Farmers' Perception and Awareness on Crop Insurance: Some Evidences from Telangana

6.1 Introduction

This chapter examines farmers' perceptions, understanding, and adaptability to crop insurance as a risk mitigation tool in sample villages of Telangana's Nalgonda district. The sample farmers' opinions on several aspects of crop insurance were elicited. These include farmers' incentive to subscribe to crop insurance and their experience with it, farmers' knowledge of various crop insurance programs, farmers' perceptions of rainfall, their opinions on premium rates, premium subsidies, crops, and risks covered, and proposals for strengthening and enhancing Telangana's crop insurance schemes.

In the previous chapter, we analyzed the determinants of farmers' participation by using the secondary data where we observed that it cannot explain what the farmers' opinions and awareness levels on crop insurance schemes introduced by the governments in India. There has been some mismatch in the sense that secondary data provided by the AICIL and field-level experiences. Thus, it is very imperative to know what factors and constraints are behind such a mismatch. Again, for effective policy formulation to bring about sustainable agricultural insurance growth, it is inevitable to recognize the different factors that influence the adoption of insurance. Further, it is known that the farmers' awareness levels on crop insurance in India are very low. This is one reason why crop insurance schemes in India are not successful in achieving their objectives. This chapter analyses and compares the farmers' awareness levels and responses to crop insurance products in the selected villages, including two different ecosystems, i.e., rainfed and irrigated ecosystems. The first section deals with the introduction, data, and methodology of the chapter. The second section focused on results discussion.

The success of crop insurance programs or schemes in any country is determined not only by the government's goal of mandatory conditions to subscribe to crop insurance schemes, but also by favorable subjective aspects. The latter includes, firstly, demand for crop insurance protection on the part of a considerable number of people, second, an understanding on their part of the meaning and significance of crop insurance and third is the understanding about the crop insurance schemes. Farmers buy the crop insurance product when they are fully aware of the

advantages and number of crops covered and perils covered in the crop insurance schemes. In the majority of developing countries, there is little visible demand for insurance among farmers. This, however, may not be a very serious obstacle as it does not take much time to create an understanding of the importance and need for protection against risks and what would appear to be more serious is the almost general lack of appreciation among farmers in these countries of the real nature of insurance. But even this may be overcome with proper education and publicity.

Crop insurance schemes have a low level of awareness, partially due to a lack of appropriate localized communications and, more importantly, a lack of actual initiatives for brand building and awareness-raising campaigns. Crop insurance subscriptions are required for all loanee farmers in India and its various states who are members of various crop insurance schemes. With premiums deducted at the time of crop loan payment and claim settlements credited to the farmer's crop loan account, uneducated farmers are unaware that crop insurance schemes exist, not to mention that bankers do not inform them of the reason for the premium deduction, and even illiterate farmers would not question the bankers on why the amount is deducted. When it comes to less trained farmers and educated farmers, both groups are aware of the crop insurance scheme's presence but are unaware of its full benefits. Since bankers do not have enough time to illustrate the features and benefits of crop insurance products. Crop insurance policies are less well-known among non-loanee farmers than among loanee farmers. As a result, non-loaned farmers' crop insurance participation is even lower. As a result, large-scale pilot projects must be performed as part of policy development in order to create viable communication models. Since NAIS is a multi-agency policy, the implementing agency is currently not involved, except in state capitals. Non-loaned peasants are offered the scheme by rural credit agencies. These farmers are unfamiliar with and insecure about approaching distant credit agencies. It would be a necessary effort for committed rural agents to provide service, with appropriate communication and training programs to back them up (Planning Commission, 2007).

The AICIL is now a responsible institution for enhancing awareness among farmers irrespective of the nature and types of farmers. The bankers are in the second position where they need to conduct insurance campaigns in rural villages. Personnel from the agriculture department should be tasked with disseminating knowledge about crop insurance policies and their benefits. Crop insurance schemes will benefit from the shared coordination and cooperation of all stakeholders,

as this will increase crop insurance visibility and, as a result, the schemes will produce positive results for farmers.

The third objective of the thesis is to examine the farmers' perception, awareness levels and determinants of farmers' awareness of crop insurance schemes in selected sample villages of Nalgonda district of Telangana. This objective is examined in this chapter.

6.2 Data and Methodology

6.2.1 The Data

The primary data is used in this study to investigate the factors that influence farmers' crop insurance awareness. Purposive sampling was used to collect primary data from 430 farmers (215 from each village) in two villages: Yellareddygudem (rainfed ecosystem) of Narkatpally mandal and Chelmareddygudem (irrigated ecosystem) of Anumula mandal of Nalgonda district, Telangana State. The rationale for choosing these villages is that they have the best agricultural production performance, crop insurance, and no farmer has committed suicide as a result of crop loss, despite having experienced crop loss several times in the last 25 years.

6.2.2 The Method

The study has used percentages, averages, and basic growth rates to assess awareness levels. Typically, crop insurance demand or farmers' ability to pay for insurance studies is used to justify an individual's decision to buy or not to buy an insurance policy. According to the anticipated utility principle, insurance demand represents an individual's risk aversion and demand for income certainty (Wagstaff, A 2000). The contingent valuation process, the disclosed preferential theory or strategy, and a combination of the use of theory with microeconomic household variables and the market, according to previous literature on agricultural insurance demand, there are three ways to estimate farmers' decisions on demand for crop insurance. Academicians have used the Linear Probit Model, Logistic Regression Model, and Probit Model in addition to these. The Probit Model was used to describe the determinants that affect the crop insurance market. We chose this model because our dependent variable, crop insurance demand, is a qualitative dependent (binary variable) variable that is evaluated as a binary response of zero or one, preventing us from using the Classical Linear Regression Model (CLRM) and necessitating the use of other models. Keeping all of this in mind, the Logit and

Probit models generated nearly identical results for large samples. The Probit model is more complex than the Logit model, according to Asteriou and Hall 2007. Since the dependent variable in this research study is a dichotomous dummy variable, we used the Probit Model. We chose this model because it solves the problems of residual non-normality, heteroskedasticity, and a smaller R-square, so we used it in our research. The Probit Model was used to identify crop insurance determinants in two villages in Telangana State, Nalgonda, in this report. To define determinants of crop insurance demand, the Probit model is determined separately for the two settlements. The crop insurance claim's usable shape model is shown below.

Farmer's awareness on crop insurance (awarecis)= f (fage, farmexpe, ffamilysize, feducation, farmsize, flandposition, flandquality, irrigationsource, livestockvalue, tfarmincome, costofculti, sourceagrifinance, croplosscauses, sourcesriskmiti, sourcescisaware, claimdifficult, riskmitiothercis, bankersrole, premiumafford)

Table 6.1 shows names of variables, descriptions of measurement and type of variables. Farmers' awareness of crop insurance (awarecis), which is a binary variable in the above function, equals one if they are aware of crop insurance and zero if they are not. Head farmer's age (fage), education level of farmer (feducation), and farm experience of farmer (farmexpe) are measured in years; family size (ffamilysize) is measured as the number of people in a family; land position (flandposition) is measured as own land equals to one and rent land equals to two; livestock value (livestockvalue), total farm income (tfarmincome), and cost of cultivation (costofculti) are measured in monetary terms in lakhs of Indian rupees; irrigation source (irrigationsource) is canal equals to one and rainfed equals to zero.

In this research, we looked into the major factors that influence farmer understanding of crop insurance schemes. Farmers' understanding has been categorized as a binary variable based on whether or not they are aware of crop insurance. A Probit Model methodology was used to investigate the impact of different socio-economic factors on farmer decisions. The Probit Models are mentioned below.

$Y = \alpha i + Xi\,\beta i + U_i$

Where Y represents a farmer's decision to purchase crop insurance, with Yi=1 indicating that the respondent is able to purchase and Yi=0 indicating that the respondent is not. Xi represents the 1-K vector of observed variables influencing the farmer's judgment, βi represents the K-1 vector of unknown estimation parameters, and Ui represents the unrecognized term of error. Following Velandia et al. (2009), we measured the marginal effects of various explanatory variables on the probability of taking out crop insurance.

Table 6.1: List of Variables' Names and Type

Variable name and description	Type
awarecis= Awareness on CIS (crop insurance scheme), 1 if aware, 0 if not	Binary
purchcis= Purchased CIS, 1 if purchased, 0 if not	Binary
awarenais= Aware of NAIS, 1 if aware, 0 if not	Binary
fage= Household head's age in year	Continuous
farmexpe= Farm experience in year	Continuous
ffamilysize= Farmer family size in number	Continuous
feducation= Head farmer's education in year	Continuous
farmsize= Farm size in hectare	Continuous
flandpositon= Farm land position,1 upper land, 2 medium land, 3 lower land	Categorical
flandquality= Farm land quality, 1 alluvial, 2 clay, 3 loamy,4 red, 5 mixed	Categorical
irrigationsource= irrigation source, 1 canal, 2 tank, 3 dugwell, 4 bore/tube well, 5 rain	Categorical
livestockvalue= Livestock value in total Indian rupees	Continuous
tfarmincome= Total farm income in total Indian rupees	Continuous
costofculti= Cost of cultivation in total Indian rupees	Continuous
sourceagrifinance=Sources of finance, 1 commercial bank, 2 RRBs, 3 co-operative bank, 4 money lender, 5 friends/relatives, 6 others	Categorical
croplosscauses= Crop loss causes, 1 drought, 2 flood, 3 less rain, 4 rain surplus	Categorical
sourcesriskmiti= Risk mitigation source, 1 livestock, 2 off-farm, 3 integrated farming, 4 stop cultivation, 5 migration to urban areas, 6 crop insurance, 7 others	Categorical
sourcescisaware= Sources of CIS awareness, 1 radio, 2 TV, 3 newspapers, 4 bank, 5 AIC staff, 6 ideal farmers, 7 insurance agents, 8 websites, 9 others	Categorical
claimdifficult= Claim difficult, 1 if yes, 0 if not difficult	Binary
riskmitiothercis= Other than CIS risk mitigation tactics, 1 sale of fixed assets, 2 sale of livestock, 3 depends on friends/relatives, 4 bank loans, 5 money lenders, 6 Govt relief, 7 sale of jewelry, 8 others	Categorical
bankersrole= Banker's role in CIS, 1 if yes, 0 if not	Categorical
premiumafford=Premium affordability, 1 if affordable, 0 if not	Binary

Source: Scholar's compilation

Table 6.2: Farmers' Perception of Rainfall during Last Three Years in Sample Villages

(Farmers' response in %)

Farmers perception on rainfall during last three years in sample villages		
Perception	Yellareddygudem	Chelmareddygudem
Adequate	58.60	68.84
Inadequate	7.44	8.37
Normal	28.37	19.07
Full shortage	5.58	3.72

Source: Field Survey, 2016-17

6.3 Farmers Perception on Rainfall

Table 6.2 summarizes farmers' perceptions of rainfall over the last two years based on a field survey conducted in two villages in Nalgonda district: Yellareddygudem, a rain-fed village, and Chelmareddygudem, a fully irrigated village. Around 60 percent of the farmers in both the villages felt that rainfall was adequate and the percentage of farmers felt rainfall normal during the last two years was high in rainfed villages, i.e., 28.37 percent and 19.07 percent in the irrigated village. Farmers felt inadequate and a shortage of rainfall is more or less similar between the two villages. Farmers have a general tendency to give more weight to negative effects that lead to higher perceptions of risk. With regard to long-term climate variability, in our analysis, farmers' observations that rainfall patterns change well corroborated with expectations from other parts of the African continent but were not confirmed by realistic trends in rainfall data from the five sites of the study. The key implication of our results is the need for knowledge and risk assessment during the production and promotion of technologies involving major smallholder farmers' investments and caution in interpreting farmers' expectations of long-term climate variability and change (Rao et al., 2011).

Table 6.3: Farmers' Awareness Level on Crop Insurance Schemes in Sample Villages

(Farmers' response in %)

Farmer's awareness level on crop insurance		
Awareness on CIS	Yellareddygudem	Chelmareddygudem
Aware	25.12	26.51
Non-aware	74.88	73.49
Awareness on purchasing insurance		
Aware	19.53	13.02
Non-aware	80.47	86.98
Awareness on NAIS		
Aware	6.05	4.65
Non-aware	93.95	95.35
Awareness on AICIL		
Aware	6.98	6.51
Non-aware	93.02	93.49
Awareness on availing crop insurance		
Aware	6.05	4.65
Non-aware	93.95	95.35
Awareness on total premium paid by farmer		
Aware	12.09	7.91
Non-aware	87.91	92.09
Awareness on total crops covered		
Aware	15.35	12.09
Non-aware	84.65	87.91
Awareness on risks covered		
Aware	6.05	7.44
Non-aware	93.95	92.56
Awareness on premium subsidies		
Aware	21.40	7.44
Non-aware	77.67	91.16

Source: Field Survey, 2016-17

6.4 Awareness on Crop Insurance

Table 6.3 depicts farmers' perceptions of various aspects of crop insurance: approximately 75% of farmers in two villages are unaware of crop insurance, while only 25% of people are aware of crop insurance schemes. The answer to the question is that you know that 86.98 percent of farmers rely on crop insurance purchases that they are not aware of, which is higher in the

irrigated region than 80.47 percent in the rain-fed area. It is a very interesting point that all crop loan farmers were moved to NAIS by default, but 95 percent of farmers in two villages did not know about NAIS and only 4-6 percent of the growers were aware of it.

In addition to the above, India's Agriculture Insurance Company Limited was set up in 2002 to deliver crop insurance exposure and financial support to growers in the absence of only notified or insured crop, but it is not known to 93 percent of farmers in both villages. Only 7 percent of farmers are aware of AICIL and 93 percent of farmers do not know how to use insurance for crops. It is surprising that, while switching the crop insurance product, nearly 90 percent of farmers do not know the premium amount paid for the crops. About 70-90 percent of farmers in both ecosystems do not know about crops and the risks covered in crop insurance products and premium subsidies provided by union and state governments. Coming to the weather-based insurance products, 95 percent of farmers are not aware of them in both study villages. Only 5 percent of educated growers are aware of this product. Last but not least, 85-90 percent of farmers in two villages are not aware of livestock insurance schemes.

Table 6.4: Factors Motivated Farmers to Subscribe Crop Insurance Schemes in Sample Villages

(Farmers' response in %)

Factors motivated to take the NAIS		
Perception	Yellareddygudem	Chelmareddygudem
Bank's compulsion	65.58	76.74
Financial security	11.16	6.05
Good experience from other farmers	15.81	8.37
Good source of risk mitigation in agriculture	7.44	8.84

Source: Field survey, 2016-17

6.5 Motivation for Crop Insurance

Table 6.4 shows motivating factors for crop insurance. More than 65 percent of the insurance beneficiaries at Yellareddygudem and 77 percent of the beneficiaries in Chelmareddygudem villages revealed that bank compulsion was the major determinant or motivation to subscribe to the NAIS. Farmers were motivated by financial security, as well as good experience from

progressive and educated farmers. The intention of providing this crop insurance was to reduce risk in agriculture, but only about 1%, or about 8%, of people thought it was a motivation.

Table 6.5: Sources of Farmers Awareness on Crop Insurance Schemes

(Farmers' response in %)

Source Type	Yellareddygudem	Chelmareddygudem
Electronic Media	9.30	10.23
Radio	23.26	20.47
Print Media	10.23	11.63
Banks	31.63	19.07
Insurance companies	0.00	10.70
Govt. advertisement	1.40	9.30
Progressive farmers	20.00	13.95
Agriculture officers	0.93	3.72
Others	3.26	0.93

Source: Field Survey, 2016-17

6.6 Sources of Farmers' Awareness on CIS

Table 6.5, attempted to explain the sources of farmers' awareness of crop insurance schemes in selected villages. About 40 percent of the growers in both villages have received awareness on crop insurance from print and electronic media like newspapers, radio, and television. The banks played a key role in disseminating awareness on crop insurance, i.e., 31.63 percent in Yellareddygudem village and it is 11.63 percent in Chelmareddygudem. Insurance companies and agriculture extension personnel played a minor role in bringing crop insurance products to the attention of farmers. Finally, educated farmers and progressive farmers in their respective villages are attempting to raise crop insurance and its products awareness, i.e., 15-20% in two study villages, Chelmareddygudem and Yellareddygudem, respectively.

Table 6.6: Perception of Farmers on Premium Rates

(Farmers' response in %)

Farmers response on CI premium		
Perception	Yellareddygudem	Chelmareddygudem
Bankers informing about crop insurance		
Yes	21.40	20.00
No	78.60	80.00
Farmers want full premium subsidy		
Yes	23.72	17.21
No	75.35	82.79
Private sector intervention required in Indian crop insurance		
Yes	6.51	6.51
No	93.02	93.49
After subsidy by govt. premium rate is affordable		
Yes	26.51	29.30
No	72.56	70.70

Source: Field Survey, 2016-17

6.7 Premium Rates

The premium rate in any insurance scheme is an important determinant; similarly, it is an important factor to determine farmers' participation and insurance coverage. Therefore, Table 6.5 tried to explain farmers' responses to premium subsidies. 75 percent of the farmers in Yellareddygudem and 82.79 percent of farmers in Chelmareddygudem villages are expected full premium subsidy on all crops and perils. More than 93 percent of them opposed the involvement of the private sector in the crop insurance business and felt it is not healthy for the farming community. Around 70 percent of the farmers in both the ecosystems feel that the amount of premium paid by them after excluding subsidies by the government is affordable.

Table 6.7: Experience of Farmers with Crop Insurance Scheme

(Farmers' response in %)

Farmers experience on CI		
Perception	Yellareddygudem	Chelmareddygudem
Crops covered		
Satisfactory	50.23	49.77
Non-satisfactory	49.77	50.23
Sum insured		
Satisfactory	23.26	29.30
Non-satisfactory	76.28	70.70
Premium rate		
Satisfactory	34.42	22.33
Non-satisfactory	65.58	77.21
Crop loss assessment		
Satisfactory	20.00	13.49
Non-satisfactory	80.00	86.51
Policy documentation		
Satisfactory	31.63	22.79
Non-satisfactory	68.37	77.21
Area approach		
Satisfactory	18.60	13.488
Non-satisfactory	81.40	86.512
Indemnity level		
Satisfactory	28.84	20.93
Non-satisfactory	71.16	79.07
Crop cutting experiments		
Satisfactory	21.86	17.21
Non-satisfactory	78.14	82.79
Claim procedure		
Satisfactory	24.19	17.67
Non-satisfactory	75.81	82.33
Products and services of AICIL		
Satisfactory	23.72	16.74
Non-satisfactory	75.81	83.26

Source: Field Survey, 2016-17

6.8 Farmers' Experience on Crop Insurance

Table 6.7 summarizes the various aspects of farmers' experiences and perceptions of crop insurance products and programs. About 50 percent of farmers in both villages are not satisfied with the number of crops being covered in existing crop insurance products and the rest of them are satisfied. More than 70% of growers in two villages said they are dissatisfied with the sum insured, and the remaining farmers are dissatisfied with the premium rates, which ranged from 65.58 to 77.21 percent. In terms of crop loss assessment, only 20% of farmers thought the procedure was good, but the remaining 80% were dissatisfied with the methods of loss assessment, crop cutting experiments, and area method. Unlike life insurance and motor vehicle insurance, crop insurance holders will not be given any policy holding document or bond, even though farmers purchased crop insurance. Hence, more than 70 percent of farmers are not satisfied with the policy documentation procedure in crop insurance. Current crop insurance schemes in India and its states use an area approach to crop loss assessment. About 80-85 percent of farmers feel that the area approach of loss assessment is not satisfactory and which does not consider individual loss in farming. Around 80 percent of growers in both villages are not satisfied with the indemnity level and 80 percent of them are unaware of products and services offered by AICIL. The most significant reason for the failure of crop insurance in India is claims and claim procedure difficulties. 75-82 percent of growers from two ecosystems felt that claim procedure is not satisfactory.

Table 6.8: Farmers' Suggestions and Opinions to Improve the Crop Insurance Scheme

(Farmers' response in %)

Suggestions to improve the crop insurance		
Perception	Yellareddygudem	Chelmareddygudem
Cover more crops in two seasons	29.77	29.30
Individual crop loss assessment	49.30	31.63
Less premium	6.05	5.12
Faster reimbursement of claims	5.58	17.21
loss assessment is Village/GP	2.33	10.70
soil fertility as a unit of loss assessment	0.47	0.93
CCEs by agriculture officers	1.40	0.93
More responsible participation of AOs	3.26	4.19
Others	1.40	0.00

Source: Field Survey, 2016-17

6.9 Suggestions to Strengthen the Crop Insurance

Table 6.8 explains farmers' suggestions and opinions to improve the existing crop insurance schemes in UAP and India. About 30% of farmers in both study villages felt that the current crop insurance schemes were covering fewer crops; it needs to be increased in both seasons. The rainfed village in this study, Yellareddygudem farmers have been growing the more volatile cotton crop. Hence, 49.30 percent of the farmers suggested that the crop loss assessment would be on an individual basis, but it is 31.63 percent in Chelmareddygudem village. The premium rate is one of the key determinants of farmers' participation in crop insurance policies. Around 61.00 percent of the growers suggested that the premium rates should be less than existing rates. The present premium rates range between 2.00 percent to 6.00 percent. However, premium rates under the new PMFBY have been reduced to 1.5 percent in the hope that it will provide farmers with an additional incentive to participate in crop insurance policies. One of the major issues with crop insurance in India that has yet to be resolved is the reduction of claim settlement delays.17.50 percent of the growers said that quick claim settlements induce the farmers to subscribe to crop insurance policies. As per the data in the table above, 4 percent of the growers in two villages advised that the more responsible participation of agriculture insurance stakeholders, namely agriculture extension personnel, bankers, insurance company personnel and

farmers will increase the crop insurance coverage in Nalgonda and Telangana. The possibility of crop loss in the rainfed region is relatively higher than that of the irrigated region, hence, 2.23 percent of farmers from Yellareddygudem felt that the crop loss assessment unit would be individual and it is 10.70 percent in Chelmareddygudem village.

Table 6.9: Other than CIS Risk Mitigation Tactics of the Farmers in Sample Villages

(Farmers' response in %)

Other than CIS risk mitigation tactics		
Tactic Type	Yellareddygudem	Chelmareddygudem
Sale of fixed assets	13.95	12.09
Livestock	26.51	26.51
Friends and Relatives	6.05	7.91
Bank loans	37.21	41.86
Money lenders	4.19	2.79
Govt. relief	4.19	4.19
Land lease	2.79	0.47
Sale of jewelry	3.26	3.26
Stop cultivation	1.86	0.93

Source: Field Survey, 2016-17

6.10 Risk Mitigation Strategies

There is a common quote that Indian agriculture is a gamble with monsoons. Agriculture is the riskiest prophet, and farmers must always be cautious in order to manage or mitigate the risk and uncertainty associated with agricultural production. Since the beginning of agriculture, farmers have been using several strategies to cope with the risk and uncertainty in the agriculture sector. Table 6.8 explains farmers' risk mitigation strategies other than crop insurance. It is found that 37.21 percent of farmers in Yellareddygudem and 41.86 percent of farmers in Chelmareddygudem felt that bank loans will help them to get out of the crop loss problem and make it possible to invest in agriculture production in the next crop season or year. Around 40 percent of farmers in booth villages felt that the sale of fixed assets and livestock has been used as a risk mitigation tactic and 4.19 percent of the respondents are expecting government relief during adverse years of agriculture production. Farmers are also depending on several other

strategies of risk mitigation, namely sale of jewelry, friends and relatives, money lenders and others. Even though the agriculture sector has been facing several problems, many farmers have been continuing farming activities. The last component of the table reveals that 1.86 percent of the farmers from Yellareddygudem and 0.93 percent of farmers from Chelmareddygudem villages wish to leave the agriculture sector and stop production.

Table 6.10: Farmers' Response to Seeking the Type of Insurance Provider

(Farmers' response in %)

Farmers Seeking for The Type of Insurance Provider		
Type Insurance Provider	Yellareddygudem	Chelmareddygudem
Rural insurance agent	51.63	45.12
Banks	28.37	40.00
Self-help groups	0.47	6.51
Agriculture officers	14.42	6.51
Post offices	2.33	1.40
Others	2.79	0.47

Source: Field Survey, 2016-17

6.11 Insurance Service Provider

Agriculture insurance agents have been working for the sales of crop insurance products in countries like the USA and Canada, but this kind of provision is not prevailing in India. Hence, we collected information from the farmers seeking what type of insurance provider. Table 6.9 shows that nearly 52 percent of farmers in Yellareddygudem village and 45.12 percent of farmers in Chelmareddygudem village have been anticipating the arrival of rural insurance agents, who can explain the benefits, terms, and conditions of insurance products. The percentage of farmers seeking insurance products from banks is 28.37 and 40.00 in Yellareddygudem and Chelmareddygudem villages respectively. Besides these, they also seek insurance products from agricultural officers, which are 14.42 percent in the rainfed village and 6.51 percent in the irrigated village and, as per the above table, the remaining service providers are self-help groups and post offices.

6.10 Factors Affecting Farmers' Awareness on Crop Insurance

A report on the feasibility of weather-based crop insurance in India states: “The goal of achieving a minimum knowledge and awareness threshold among farmers should be paramount to a technically complex concept such as crop insurance, before encouraging farmers to choose between different types of social goods such as crop insurance” (Agricultural Finance Corporation Limited, 2011).A lack of awareness among farmers about the crop insurance mechanism results in lower participation, negative selection, and dissatisfaction among those involved, according to another study examining crop insurance options in India. (Indian Government, 2014).

The Agricultural Insurance Company (AIC) also assumes concentrated efforts to educate farmers through marketing and awareness campaigns about the schemes it runs and the benefits of insurance cover for their crops. AIC is in the process of launching the Kisan Bima Sans, rather than raising awareness among farmers about the benefits of securing their crop and bringing in uncovered so far. Crop insurance in India will continue to rely on government policy and its financial support in some form or another to a greater extent than intended. So far, government policies have remained broad-based, farmer-friendly, crop insurance support aimed at ensuring the agricultural sector's stable growth, which is likely to continue in the future as well. This dedication is reflected in the formation of AIC. Despite realizing that crop insurance may not seem viable at the moment or soon, this support is likely to continue as long as it serves farmers' interests as farmers' risk management continues to be the government's primary concern. Crop insurance is unfamiliar to the Indian farming culture. According to a National Sample Survey Organization (NSSO) survey, only 4% of farmer households had ever insured their crops, and 57% of those households were unaware that crops could be insured.

The advantages of a competitive market in terms of the variety of crop insurance products provided by different insurers are negated by the gaps and shortcomings in India's agricultural extension scheme, as well as farmers' low educational attainment and comprehension. The aim should be to provide consumer (farmer) services in a competitive market in such a situation. During primary research, almost all stakeholders expressed disappointment with the current level of customer (farmer) service. It entails a crop insurance model in which the entire site is marketed via a single standard crop insurance plan that is differentiated based on consumer

satisfaction and product interaction.Furthermore, the three major crop insurance insurers backed the idea of a crop insurance model that prioritizes distribution and operation over the product itself. In the Indian context, the two most significant crop insurance models are the Spanish and American models.

Given the high cost of providing crop insurance to farmers, spending on dissemination and promotion through the media should be considered a minor part of annual operating income and financial support expenditure. Crop insurance's awareness-raising strategy may be modeled after the Mahatma Gandhi Rural Employment Guarantee Scheme's remarkably successful communication and promotional campaign (alternatively, NREGS).Crop insurance can also be promoted more effectively through the local self-government network. Toll-free service lines could be used to provide personalized answers to prospective and current farmers' clients' concerns and grievances.

It may be useful to use the existing toll-free service offered by agricultural universities and other extension agencies. Interactive media such as street-play or insurance games that are adaptive to local conditions can be used to simplify the insurance process for more tailored marketing operations. Such schemes necessitate extensive publicity in all notified districts and villages. State/UT Agricultural Extension Officers' audiovisual media expertise should be included. To avoid confusion and misunderstanding, bank employees who will be collecting premiums, processing declarations, and drafting forms, among other tasks, should be educated. Fears would be dispelled, grievances would be resolved, and bottlenecks in the scheme's smooth implementation would be removed with training programs and workshops, as well as IA officers' visits to banks. All villages in participating states/UTs will receive pamphlets. The IA would do this by creating a short film that highlights the Scheme's main features.

Farmers' knowledge of the crop insurance scheme, familiarity with the various products offered by insurance companies, level of satisfaction/acceptance, farmers' opinions on premium rates and subsidies, claim payouts (if any) received by insurance companies, timeliness in receiving payouts, and transparency in the scheme were among the topics covered by the schedules. The field surveys were followed by client approval of the study schedules/questionnaires and their field testing.

Farmers and rural residents with poor literacy and financial sophistication face significant difficulties in selling complex agricultural insurance plans. Concerning the difference between NAIS and WBCIS, the majority of field sales professionals and even insurance company workers have reservations. There are substantial gaps in the public's understanding of insurance in general and NAIS in particular, as shown by our primary research findings.

As our findings show, working with an insurance policy explanation is a crucial predictor that can help or hinder the implementation of any agricultural insurance scheme in the developing world. Farmers' answers to satisfaction questions about this dimension reveal the insurers' lack of explanatory capacity. Farmers with higher levels of literacy and education record abhorrently low satisfaction. According to the other classes, uneducated people are frequently dissatisfied in this region. The field's persistently low level of awareness can be blamed on selling agents/intermediaries/delivery networks' inability to simplify and communicate complex actuarial terms to farmers, as well as their inability to comprehend the processes and fundamentals of agricultural insurance contracts. These stylized facts aid in the case for mass insurance education and financial literacy programs that are targeted to the customer during the marketing process. Farmers' illiteracy has worsened their problems, as has the company's refusal to assist them. The same has been achieved by Sajjata Sangh, a network of non-governmental organizations (NGOs) in Gujarat working in the field of natural resource management and promoting crop insurance in the state over the last two Kharif seasons. Experts at Tamil Nadu Agriculture University argue that public crop insurance coverage is broader because it is needed for loan farmers, but that it has had limited success in terms of actual farmers covered and benefited, while insurers diversify with a variety of weather insurance products with little increase in coverage. However, both yield and weather-related insurance policies have been delivered to Tamilnadu farmers who are having trouble enrolling due to a lack of understanding of the enrollment process and claims management procedures.

Table 6.11: Summery Statistics of Yellareddygudem (Farmers' awareness determinants of CIS)

Variable	Mean	Std. Dev.
awarecis	0.25	0.43
awarenais	0.06	0.24
fage	48.47	14.10
farmexpe	26.98	14.81
ffamilysize	4.10	1.18
feducation	0.91	1.28
farmsize	8.27	4.73
flandposition	1.26	0.44
flandquality	1.80	0.74
irrigationsource	1.11	1.01
livestockvalue	1.17	1.21
tfarmincome	2.91	3.57
costofculti	1.08	1.18
sourceagrifinance	1.44	0.89
croplosscauses	1.81	1.44
sourcesriskmiti	2.53	2.09
sourcescisaware	3.53	2.09
claimdifficult	0.27	0.45
riskmitiothercis	3.42	1.87
bankersrole	0.21	0.41
premiumafford	0.28	0.47

Source: Scholar's estimation

Table 6.11 reveals the summary information of the variables used (Probit model for Yellareddygudem) in identifying the factors of farmers' awareness of crop insurance in the Yellareddygudem village of Nalgonda District. The average values of ages of the farmers surveyed in the village is 48.47 and the mean value of farm experience is 26.98 and their standard deviations are 14.10 and 14.81 respectively. The average family size and education are 4.10 and 0.91 and its deviation is 1.18 and 1.28 respectively. The average farm size is 8.27 acres and its standard deviation is 4.73. The mean values of income from livestock and total incomes are found at 1.17 and 2.91 lakhs and its deviation is 1.21 and 3.57 lakhs respectively. The average cost of cultivation is 1.08 means 10800 per acre.

Table 6.12: Summery Statistics of Chelmareddygudem (Farmers' awareness determinants of CIS)

Variable	Mean	Std. Dev.
awarecis	0.27	0.44
awarenais	0.05	0.21
fage	49.04	13.23
farmexpe	28.08	13.52
ffamilysize	4.18	1.72
feducation	1.91	1.28
farmsize	1.28	0.59
flandposition	1.01	0.14
flandquality	1.81	0.75
irrigationsource	1.14	0.76
livestockvalue	0.78	1.30
tfarmincome	2.12	3.87
costofculti	0.92	1.52
sourceagrifinance	1.63	0.89
croplosscauses	1.49	1.03
sourcesriskmiti	2.56	2.21
sourcescisaware	4.07	2.11
claimdifficult	0.25	0.43
riskmitiothercis	3.33	1.67
bankersrole	0.20	0.40
premiumafford	0.29	0.46

Source: Scholar's estimation

Table 6.12 discloses the summary information of the variables used (Probit model for Chelmareddygudem) in identifying the factors of farmers' awareness of crop insurance in the Chelmareddygudem village of Nalgonda District. The average values of ages of the farmers surveyed in the village are 49.40 and the mean value of farm experience is 28.08 and their standard deviations are 13.23 and 13.52 respectively. The average family size and education are 4.18 and 1.91 and its deviation is 1.72 and 1.28 respectively. The average farm size is 1.25 acres and its standard deviation is 0.59. The mean values of income from livestock and total incomes

are found at 0.78 and 2.12 lakhs and its deviation is 1.30 and 3.87 lakhs respectively. The average cost of cultivation is 0.92 (9200) per acre.

Table 6.13: Probit Regression Results for Rainfed Ecosystem (Yellareddygudem) to the Determinants of Farmers' Awareness on Crop Insurance

Awarecis	Coef.	Std. Err.	z	P>z
fage	.0075038	.0112782	0.67	0.506
farmexpe	.0008521	.010401	0.08	0.935
ffamilysize	.1851936	.090369	2.05	0.040**
feducation	.0929376	.0873415	1.06	0.287
farmsize	-.0250686	.0245046	-1.02	0.306
flandposition	-.1279556	.2548612	-0.50	0.616
flandquality	.0219809	.1516654	0.14	0.885
irrigationsource	-.0871421	.1121557	-0.78	0.437
livestockvalue	.1736617	.0844818	2.06	0.040**
tfarmincome	.0612764	.0390153	1.57	0.116
costofculti	-.1399624	.1361585	-1.03	0.304
sourceagrifinance	-.1210681	.1347249	-0.90	0.369
croplosscauses	.0180286	.0769981	0.23	0.815
sourcesriskmiti	.1118976	.0522201	2.14	0.032**
sourcescisaware	.0044731	.0544039	0.08	0.934
claimdifficult	.1692831	.2593967	0.65	0.514
riskmitiothercis	-.0047339	.0594843	-0.08	0.937
bankersrole	.7731526	.2512598	3.08	0.002**
premiumafford	.4602836	.2578283	1.79	0.074***
_cons	-2.328404	.7648613	-3.04	0.002**

Number of observations = 215
LR chi2(19) = 49.24
Prob > chi2 = 0.0002
Log likelihood = -96.558065
Pseudo R2 = 0.2032

Source: Scholar's Estimation

Notes: *, **, *** represent the level of significance at 1%, 5% and 10% respectively

The Probit regression results are shown in Table 6.13. In our Probit specification, we consider farmers who replied with a code "1" for crop insurance knowledge, which means the attribute is present, and a code "0" for crop insurance unawareness, which means the attribute is absent. The

likelihood proportions, or the mixture of information and unconscious probabilities, are the coefficients, according to the table. If a coefficient value is greater than 1, the value on the right side of the decimal point represents an average percentage point difference between the chances of success (in this case, being "aware") and the chances of failure (in this case, failure) (being "not aware"). If the coefficient's value is less than 1, the difference between failure and success chances is 1 minus the coefficient's value.

The findings back up our findings from the bivariate study. The primary data revealed that farmer knowledge is extremely poor. We find that a farm household's access to formal loans is a significant determinant of conscience, as predicted. Crop insurance is related to short-term crop credit in India (and many other developing countries). However, not all farmers who take out a crop loan will be insured since different types of loans and/or crop insurance might not be available in the region. Although not all farmers who take out loans are insured, there is a good chance they would be aware of it if they take out a loan from a financial institution.

Higher education levels could have a positive impact on crop insurance awareness; trained farmers are more likely to understand how an insurance scheme works. However, the literature on the effect of education on crop insurance decision-making is mixed. Although Giné and Yang (2009) discovered that farmers' use of farm loans combined with insurance increases as they get more schooling, Giné, Townsend, and Vickery (2008) found no such correlation. In our research, we discovered that educational achievement was strongly positively correlated with the dependent variable, but that it was not a significant factor in determining farmers' knowledge of crop insurance. One theory may be that we look at a household's highest level of education rather than the education of the household's head. When the most educated person in a family decides to purchase insurance, the effect of education on such decisions can be underestimated if the household head's education is taken into account.

There was no impact on the number of cultivated crops or the primary source of income. Finally, the literature is split on the impact of household age on crop insurance demand. Although some research (such as Cao and Zhang 2012) found a positive effect, others found a negative effect (such as Giné, Townsend, and Vickery 2008) or no effect (Cole, Giné, and Vickery 2017). We

discovered in our research that the age of the household's head has little bearing on the level of consciousness.

Farmers' family size, income from livestock, crop insurance as a good source of risk reduction, and premium affordability were found to be significant determinants in the rainfed environment at a 5% significance stage (Yellareddygudem). In the irrigated environment (Chelmareddygudem), the determinants of farmers' crop insurance recognition are not the same as in the rainfed ecosystem. The explanatory variables of the Probit Model in Chelmareddygudem with a 5% significant level are sources of agriculture finance, crop loss causes claims difficulty, and premium affordability. Premium affordability is a common significant variable in both ecosystems, but the degree of significance varies, with rainfed ecosystems being 10% significant and irrigated ecosystems being 5% significant, respectively. Although a farmer's education played a significant role in improving understanding of crop insurance and appearing fair (Okoffo et al., 2016), it is not a significant factor in our model.

The farm financing variable or credit used was also found to be positively and significantly linked to farmers' perception of the 5% crop insurance scheme, suggesting that banks are playing an important role in increasing farmers' knowledge of crop insurance due to the compulsion to take crop insurance for loanee farmers and because under the current crop loan insurance. As a result, they were well-informed about the crop insurance scheme's features, procedures, and benefits and reacted positively to them. However, the remaining variables, such as farmer age, farm experience, land quality, farm size, total farm income, cultivation value, and others, are not found to be significant in both ecosystems. It is demonstrated that both models are relevant by taking into account the Chi2 values of the ecosystems and their corresponding probabilities.

The results of two Probit models have also been shown: the models were a good fit with Pseudo $R2 = 0.21$ for the rainfed ecosystem of Yellareddygudem and 0.19 for the irrigated ecosystem of Chelmareddygudem, indicating that the independent variables of these two models jointly explain the variations in the dependent variable by 21% and 19%, respectively, in study areas.

Table 6.14: Probit Results for Irrigated Ecosystem (Chelmareddygudem) to the Determinants of Farmers' Awareness on Crop Insurance

Awarecis	Coef.	Std. Err.	z	P>z
Fage	.0120828	.011863	1.02	0.308
farmexpe	-.0180891	.0118344	-1.53	0.126
ffamilysize	.0321774	.0603157	0.53	0.594
farmsize	-.1882021	.1875606	-1.00	0.316
flandposition	-1.420522	.9006404	-1.58	0.115
flandquality	.0912193	.1425903	0.64	0.522
irrigationsource	-.1006712	.173694	-0.58	0.562
livestockvalue	-.1641006	.0991504	-1.66	0.098***
tfarmincome	.0573267	.037781	1.52	0.129
costofculti	.1270446	.0706316	1.80	0.072***
sourceagrifinance	.4234572	.1360464	3.11	0.002**
croplosscauses	.2609296	.1076948	2.42	0.015**
sourcesriskmiti	-.0690777	.0564692	-1.22	0.221
sourcescisaware	.0435673	.0523265	0.83	0.405
claimdifficult	.5592707	.2402172	2.33	0.020**
riskmitiothercis	.1194467	.0638651	1.87	0.061***
bankersrole	.1422095	.3080474	0.46	0.644
premiumafford	-.7708864	.3123206	-2.47	0.014**
_cons	-.880903	1.110344	-0.79	0.428

Number of observations = 215
LR chi2(19) = 45.68
Prob > chi2 = 0.0003
Log likelihood = -101.50415
Pseudo R2 = 0.1837

Source: Scholar's Estimation

Notes: *, **, *** represent the level of significance at 1%, 5% and 10% respectively.

6.11 Summary

This chapter 6 has examined the farmers' perception and awareness on crop insurance based on the sample data from field surveys. The primary data set was collected from 430 farmers (215 from each village) in two villages: Yellareddygudem (representing the rainfed ecosystem) of Narkatpally mandal and Chelmareddygudem (representing the irrigated ecosystem) of Anumula mandal of Nalgonda district, Telangana State. Some important observations and findings are given below.

- According to the primary data, the awareness level of farmers on the crop insurance was very low in the sample villages of Telangana. Approximately 75% of farmers in study villages were unaware of crop insurance. Crop insurance policies were only known by 25% of the households. Only those farmers who had previously taken advantage of agricultural credit from banks and those with a large family size were aware of and understood crop insurance better.
- Only 7% of sample growers aware of the presence of AICIL, and 93 percent were unaware of the procedure for obtaining crop insurance. Moreover, about 90 percent of the farmers are not aware of the premium amount paid for the crops while they are switching the crop insurance product. About 70-90 percent of farmers in both ecosystems do not know about crops and the risks covered in crop insurance products and premium subsidies provided by union and state governments.
- More than 65 percent of the insurance beneficiaries at Yellareddygudem (representing the rainfed ecosystem) and 77 percent of the beneficiaries in Chelmareddygudem (irrigated ecosystem) revealed that bank compulsion was the major determinant or motivation to subscribe to the NAIS.
- About 40 percent of the growers in both villages have received awareness on crop insurance from print and electronic media like newspapers, radio, and television. The banks played a key role in disseminating awareness on crop insurance, i.e., 31.63 percent in Yellareddygudem village and it is 11.63 percent in Chelmareddygudem. Insurance companies and agriculture extension personnel played a minor role in bringing crop insurance products to the attention of farmers.

- Farmers' response to premium subsidies revealed that 75 percent of the farmers in Yellareddygudem and 82.79 percent of farmers in Chelmareddygudem villages expected full premium subsidy on all crops and perils. More than 93 percent of them opposed the involvement of the private sector in the crop insurance business and felt it is not healthy for the farming community.
- About 50 percent of farmers in both villages are not satisfied with the number of crops being covered in existing crop insurance products. More than 70% of growers in sample villages said they are dissatisfied with the sum insured.
- Unlike life insurance and motor vehicle insurance, crop insurance holders will not be given any policy holding document or bond, even though farmers purchased crop insurance. Hence, more than 70 percent of farmers are not satisfied with the policy documentation procedure in crop insurance.
- The present crop insurance schemes in India and its states have the following area approach to crop loss assessment. About 80-85 percent of farmers feel that the area approach of loss assessment is not satisfactory and which does not consider individual loss in farming.
- Yellareddygudem farmers (in the rainfed village in this study), have been growing the cotton crop, which is considered to be very volatile to climate shocks and other shocks. Hence, 49.30 percent of the farmers suggested that the crop loss assessment would be on an individual basis, but it is 31.63 percent in Chelmareddygudem village (irrigated ecosystem).
- It is found that 37.21 percent of farmers in Yellareddygudem (rainfed) and 41.86 percent of farmers in Chelmareddygudem (irrigated region) felt that bank loans will help them to get out of the crop loss problem and make it possible to invest in agriculture production in the next crop season or year.
- Nearly 52 percent of farmers in Yellareddygudem village (rainfed) and 45.12 percent of farmers in Chelmareddygudem village (irrigated) have been anticipating the arrival of rural insurance agents, who can enlighten the benefits, terms, and conditions of insurance products.
- On the issue of the determinants of farmers' awareness of crop insurance, the results depicted that farmers' family size, income from livestock, crop insurance as a good

source of risk mitigation and affordability of premiums are seen as significant determinants in the rainfed ecosystem (Yellareddygudem). Explanatory variables of sources of agriculture finance, crop loss causes, claims difficulty and premium affordability are significantly determining the farmers' awareness of the crop insurance in Chelmareddygudem village.

- With respect to the determinants of crop insurance demand in sample villages, the first independent variable, farmers' age, is positively related to the dependent variable but it is not a significant variable to explain and determine crop insurance. The farm experience is found to be negatively associated with the crop insurance demand and it is significant at the 10 percent level. Similarly, farmers' understanding of crop insurance is positively and significantly correlated with crop insurance demand.

In the sample region, the level of education among farmers was not a very high and important variable in determining farmer knowledge of crop insurance. Farmers' understanding of crop insurance is influenced by the availability of premiums. Government and policymakers must therefore engage the media (both electronic and print) and develop special educational programs to educate farmers about crop insurance and its products. In this regard, it is recommended that the government mandate agricultural officers and extension staff, as well as bankers and insurance personnel, to inform farmers in Telangana and India about crop insurance schemes. Furthermore, it is recommended that these insurance policies be marketed by rural agricultural insurance brokers, which would require insurance firms to take the required steps to market their crop insurance products.

Chapter - 7
Determinants of Demand for Crop Insurance: Evidence from Sample Villages in Telangana

7.1 Introduction

In the previous chapter, we have presented the farmers' awareness levels on crop insurance in overall and NAIS in specific. We also examined the determinants of farmers' awareness of the crop insurance policies in between ecosystems represented by rainfed and irrigated ecosystems. But, 'how farmers' decisions about purchasing and not purchasing crop insurance are determined' is not covered in the previous chapter. Therefore, the present chapter deals with examining of factors affecting the crop insurance demand in the selected study villages by using the primary data.

The farming community has to make decisions about which crops to grow, the quantity and quality of each input to be used, about organic and chemical fertilizers, weed management practices, land plot allocation for different crops and other farm management activities since agriculture production is affected by uncontrolled events. These decisions are based on the returns they expected on the crops grown based on previous knowledge and farm production history. Buying crop insurance is one such factor that may reduce variance in their returns from agriculture and help the farmers get out of the crop loss problems. In different studies, empirical examination supports the theory that revenue and price are influential factors in the decision of farmers to purchase flood insurance. State-level flood insurance purchases are found to be highly interrelated with the level of flood losses in the state over the past few years (Browne et al. 2000). Farmers can purchase crop insurance if the adverse effects on crop production and crop income are reduced. Knowing the factors affecting the demands of farmers for crop insurance is therefore an important aspect for evaluating the reliability of crop insurance programs. In addition, the demand aimed at crop insurance in the world and India in particular, has received limited empirical attention. Analysis on an empirical assessment of farmers' demand for crop insurance in Telangana is presented in this chapter based on field data.

Crop Insurance Demand:

Woodard (2016) clarified that crop insurance is Indian agriculture's primary safety net. It is critical to understand farmers' demand responses. Nevertheless, much of the historical economic analysis is incomplete in providing useful data or models to infer possible market responses from changes in demand for crop insurance for different policies, product structure, or prices. More advances are needed to address these issues properly, including the following approaches:

1. Clearly, it relates several dimensions of the extent of insurance to aggregate market responses.
2. Consider differential demand responses due to changes in the premium menu rate (some costs now) and the expected return value embodied in the subsidy (later risky payments).
3. The endogeneity between the selected premium rate and deductible.

There are two main reasons for insurance demand: the impact of risk reduction and the anticipated effects on earnings. The estimated benefit price in private insurance markets to be earned by the insured person is less than the premium cost. However, the expected return from buying insurance minus the premium paid by the farmer in Indian Crop Insurance is typically positive as it is subsidized if properly priced. Generally speaking, demand models seek to estimate the relationship between the demanded quantity as a function of its cost and other variables for a certain product or service. While many metrics have been proposed to quantify insurance demand, especially for policy development, there is no generally accepted approach to what indicators should be used or how they should be modeled.

7.2 Data and Model Specification

The primary data set is used in this chapter to analyze the determinants of crop insurance demand. The primary data were collected from 430 (215 farmers from each village) farmers using a purposive sampling method from two villages, namely, Yellareddygudem (rainfed ecosystem) of Narkatpally mandal and Chelmareddygudem (irrigated ecosystem) village of Anumula mandal, Nalgonda district, Telangana (the detailed procedures of village selection, rational, and profile of the study area are given in section 3.5). The analysis is conducted

separately for two different villages, in order to find and analyze the differences in factors influencing the farmers' behavior of crop insurance demand in two different agro-climatic zones of Nalgonda district.

Typically, crop insurance demand or farmers' ability to pay for insurance studies are used to describe whether someone chooses to buy or not buy an insurance policy. The demand for insurance, according to the anticipated utility principle, represents a person's risk aversion and desire for income security (Wagstaff, A 2000). Farmers' decisions on crop insurance demand can be calculated in three ways, according to previous research on agricultural insurance demand in general and crop insurance demand in particular: through the contingent valuation process, revealed preferential theory, and a combination of theory usage with microeconomic household variables and the market. The Probit model was used to determine the factors that affect crop insurance demand. We cannot use the Classical Linear Regression Model (CLRM) since our dependent variable, crop insurance demand, is a qualitative dependent (binary variable) variable that is evaluated as a binary response of zero or one. Instead, we must use the appropriate models. For large samples, the Logit and Probit models yielded nearly identical results when these factors were taken into account. The Probit model, according to Asteriou and Hall (2007), is more advanced than the Logit model. Since the dependent variable is a dichotomous variable, we used the Probit Model in this analysis. We selected and used this model for our analysis because it tackles the issues of residual non-normality, heteroskedasticity, and a smaller R-square. Crop insurance determinants were determined using the Probit Model in two villages in Telangana's Nalgonda district. The Probit model is calculated separately for the two villages to classify demand determinants for crop insurance, and the crop insurance claim is graded operationally as follows.

Demand for crop insurance (puchsci)= f (fage, farmexpe, awarecis, ffamilysize, feducation, farmsize, awarenais, flandposition, flandquality, irrigationsource, livestockvalue, tfarmincome, costofculti, sourceagrifinance, croplosscauses, sourcesriskmiti, sourcescisaware, claimdifficult, riskmitiothercis, bankersrole, premiumafford)

Names of variables in this model are given in Table 7.1 and are almost similar to those in Chapter 6. This study has used Probit Model to find crop insurance determinants in selected

villages of Telangana. For two sample villages, Probit model is estimated separately to identify determinants of demand aimed at crop insurance. The Probit Model is specified as below:

$Y_i = \alpha i + Xi\,\beta i + U_i$

In this case, Y is the dependent variable. Yi reflects i-th farmer's willingness to purchase crop insurance under the system, with Yi equal to 1 if the respondent is willing to buy and 0 if they are not. The K-1 vector of observed variables influencing the farmer's decision is referred to as Xi. The farmer's decision is influenced by unspecified approximation parameters, βi is the K-1 vector of unspecified approximation parameters and Ui is the error word (Velandia et al., 2009).

7.3 Determinants of Crop Insurance Demand

A number of achievements in the field of empirical research on the factors influencing the demand for agricultural insurance have been achieved by the international academic community. Theoretically, most agricultural insurance demand research has developed a market model based on Von Neumann and Morgenstern's (1944) expected utility maximization paradigm. On the basis of potential losses by farmers, the household demand for agricultural coverage was determined. Arrow (1963) therefore advocated for risk-averse decision-makers to be completely protected against risks and insured equally. After 1970, the prevailing theory for why insurance markets fail concentrated on the adverse selection and moral hazard provided by asymmetric knowledge between insurers and the insured (Knight and Coble, 1997). Farmers' demand for crop insurance should be measured by their projected income, income stability, and risk aversion coefficient, according to Hazell et al. (1986). Goodwin (2001) calculated the market elasticity of crop insurance in the United States and concluded that the lack of successful demand for agricultural insurance was due primarily to crop insurance policies' widespread availability.

Goodwin et al. (2004) discovered in an observational analysis of agricultural insurance demand that once American farmers' income exceeds a certain level, their risk aversion rises, and as a result, they are less likely to buy agricultural insurance. Goodwin et al. (2004) discovered in an observational analysis of agricultural insurance demand that once American farmers' income exceeds a certain level, their risk aversion rises, and as a result, they are less likely to buy agricultural insurance.

Farmers tended to have self-insurance as their income grew, according to Serra et al. (2003), resulting in lower demand for agricultural insurance. There were few studies investigating the demand for forest catastrophe insurance compared to agricultural insurance studies. In Europe and the United States, forest insurance is also in its infancy. A forest hazard insurance policy against natural disaster shocks is rare in Europe, according to Holecy and Hanewinckel (2006), in comparison to other natural disaster threats such as floods or fires, which are usually protected by insurance policies. They also indicated that the forest insurance program's failure in Germany was due to a lack of objective scientific studies evaluating the major hazards that vast forest areas face, such as storms and snow. They also indicated that the forest insurance program's failure in Germany was due to a lack of objective scientific studies evaluating the major hazards that vast forest areas face, such as storms and snow.

Based on risk and insurance demand theory, Holthausen and Baur (2004) discovered that few forest property owners in Switzerland were interested in forest insurance. They polled forest property owners, forestry experts, and government departments to create a sample survey. This was largely due to the Swiss government's disaster response and the fact that forestry did not have a major revenue stream.

Farmers' psychology was affected by the government's disaster relief acts, according to Brunette and Couture (2008), which suppressed their demand for forest insurance. Rajmis (2008) used a logit analysis in the vicinity of Germany's Hainich National Park to assess the factors influencing local residents' demand for forest pest and storm insurance.

Pinheiro and Ribeiro (2013) used a case study of a cork oak stand in Portugal to validate the theoretical model, demonstrating that the larger the insured field, the lower the risk premium, leading to their main conclusion: the need to increase the number of insured farmers to mitigate risk. Barreal et al. (2014) propose a theoretical model for valuing forest insurance. They come to the conclusion that forest owners will profit the most from paying for such policies in wildfire-prone areas. China's efforts to boost forest insurance demand are still in their early stages, and are largely inspired by the idea of agricultural insurance. Zhang et al. (2005) investigated the use of agricultural insurance in China, conducting observational research using survey data from the provinces of Jiangxi and Shanxi.

Using the Probit Model, Ning et al. (2005) conducted a survey of cotton farmers in the Manas River Basin and ran a regression analysis to assess the factors affecting farmers' purchases of farm insurance. According to the researchers, the coefficient of variation in cotton production, total cultivated area, availability of government grants, householder farming time, and the proportion of total cotton revenue were the primary determinants of farmers' purchase activity.

Meng and Li (2011) conducted a survey of 285 households in Huai'an and Suqian, Jiangsu Province, to examine farmers' needs and satisfaction with policy-oriented agricultural insurance from four perspectives: insurance cover and liability, security level and amount of reimbursement, premium and subsidy ratio, and insurance claim services. They concluded by recommending that farmers become more aware.

Several researchers have carried out preliminary studies into the need for forest protection. Using an aggregate logistics model, Li et al. (2007) investigated the factors influencing farmers' demand for forest insurance in Young'un City, Fujian. Using the binary logistics model to examine the main influencing factors on forest insurance farmers' needs, Xie and Liu (2009) conducted a survey of 492 forest owners in Yunnan Province, China. According to the results, if farmers had purchased additional insurance, the magnitude and frequency of disasters, the condition of the forest, the prevalence of endangered species, and farm circulation limits all had a substantial positive impact on forest insurance needs.

Based on a survey of 156 farmers in Zhejiang Province, Yang and Shi (2010) used the logistic model to examine the factors influencing farmers' demand for forest insurance. The researchers showed that the amount of family employment, per capita income, the existence of unpaid loans, household income, forest tree species, and forest insurance knowledge, as measured by the most serious disaster losses, had a major impact on forest farmers' insurance demands.

Using survey data from Fujian Province, Wan et al. (2012) investigated the factors that affect farmers' participation in insurance policy forests. According to their findings, merely increasing the premium subsidy would have little impact on forest insurance enrollment rates. Li (2012) developed a forest insurance supply model to perform a theoretical study of the influencing factors on forest insurance availability and use from different supply and demand perspectives.

The international and domestic research literature offers an excellent basis for more research into concepts and methods that incorporate these research findings.

However, research into the factors that influence forest insurance claims is woefully lacking, concentrating mainly on farmer and family characteristics (such as age, schooling, and family income) as well as forest operating conditions (such as forest size, woodland quality, and forest disaster situation), ignoring the unique features of forest restoration initiatives and financial aid. As a result, empirical evidence is insufficient to provide precise and oriented theoretical support for developing forest insurance products and financial subsidy strategies.

In many ways, our study varies from previous research. First, by concentrating on six variables, our study fills a knowledge gap in existing crop insurance literature (social factors, demographic factors, economic factors, crop insurance awareness rates, sources of awareness and insurance claims, etc.). Age and education level, total family income, land size, land value, farming costs, premium affordability, and other variables are common variables.

However, several studies on the determinants of crop insurance have relied on secondary data to classify the determinants, with only a few studies relying on primary data. The bulk of these studies focused on developed countries such as the United States, Canada, and Australia, among others. Under secondary data, the premium rate, premium subsidy, and claims settlement are considered significant determinants of crop insurance demand. However, those variables may not have a sole impact on the determinants of crop insurance demand. As a result, in this chapter, the field survey data collected from farmers is used to analyze the crop insurance demand determinants. Since the dependent variable (crop insurance demand) is binary, the analysis relied on a binary response model to uncover the factors that influence it.

The aim of this research, which will use a binary regression approach, is to analyze the factors that affect farmers' decisions to participate in government crop insurance programs empirically. In addition, a Probit regression model is used in this analysis to decide whether or not crop insurance should be purchased. Decisions are not taken on the basis of a comparison of expected utility values, as is the case for a traditional EUH approach. Finally, the findings of this study will enable researchers and practitioners to predict whether Indian farmers in general, and

farmers in Telangana in particular, will participate in crop insurance programs under a variety of conditions.

Table 7.1 shows the variables used in the Probit regression model to examine the determinants of crop insurance in selected sample villages and their measurements. The variables include both categorical and continuous.

Table 7.1: List of Variables' Names and Type of Measurement

Variable name and description	Type
awarecis= Awareness on CIS (crop insurance scheme), 1 if aware, 0 if not	Binary
purchcis= Purchased CIS, 1 if purchased, 0 if not	Binary
awarenais= Aware of NAIS, 1 if aware, 0 if not	Binary
fage= Household head's age in year	Continuous
farmexpe= Farm experience in year	Continuous
ffamilysize= Farmer family size in number	Continuous
feducation= Head farmer's education in year	Continuous
farmsize= Farm size in hectare	Continuous
flandpositon= Farm land position,1 upper land, 2 medium land, 3 lower land	Categorical
flandquality= Farm land quality, 1 alluvial, 2 clay, 3 loamy,4 red, 5 mixed	Categorical
irrigationsource= irrigation source, 1 canal, 2 tank, 3 dugwell, 4 bore/tube well, 5 rain	Categorical
livestockvalue= Livestock value in total Indian rupees	Continuous
tfarmincome= Total farm income in total Indian rupees	Continuous
costofculti= Cost of cultivation in total Indian rupees	Continuous
sourceagrifinance=Sources of finance, 1 commercial bank, 2 RRBs, 3 co-operative bank, 4 money lender, 5 friends/relatives, 6 others	Categorical
croplosscauses= Crop loss causes, 1 drought, 2 flood, 3 less rain, 4 rain surplus	Categorical
sourcesriskmiti= Risk mitigation source, 1 livestock, 2 off-farm, 3 integrated farming, 4 stop cultivation, 5 migration to urban areas, 6 crop insurance, 7 others	Categorical
sourcescisaware= Sources of CIS awareness, 1 radio, 2 TV, 3 newspapers, 4 bank, 5 AIC staff, 6 ideal farmers, 7 insurance agents, 8 websites, 9 others	Categorical
claimdifficult= Claim difficult, 1 if yes, 0 if not difficult	Binary
riskmitiothercis= Other than CIS risk mitigation tactics, 1 sale of fixed assets, 2 sale of livestock, 3 depends on friends/relatives, 4 bank loans, 5 money lenders, 6 Govt relief, 7 sale of jewelry, 8 others	Categorical
bankersrole= Banker's role in CIS, 1 if yes, 0 if not	Categorical
premiumafford=Premium affordability, 1 if affordable, 0 if not	Binary

Source: Scholar's compilation

Table 7.2: Hypothesized Signs of the Variables in Probit Model of both Study Villages

Variable name	Hypothesized sign
awarecis= Awareness on CIS	Dependent variable
purchcis= Purchased CIS	Positive
awarenais= Aware of NAIS	Positive
fage= Household head's age	Positive
farmexpe= Farm Experience	Positive
ffamilysize= Farmer family size	Positive
feducation= Farmer education	Positive
farmsize= Farm size	Positive
flandpositon= Farm land position	Positive
flandquality= Farm land quality	Positive
irrigationsource= irrigation source	Positive
livestockvalue= Livestock value	Positive
tfarmincome= Total farm income	Positive
costofculti= Cost of Cultivation	Positive
sourceagrifinance=Sources of finance	Positive
croplosscauses= Crop loss causes	Positive
sourcesriskmiti= Risk mitigation sources	Positive
sourcescisaware= Sources of CIS awareness	Positive
claimdifficult= Claim difficulty	Positive
riskmitiothercis= Other than CIS risk mitigation tactics	Positive
bankersrole= Banker's role in CIS	Positive
premiumafford=Premium affordability	Positive

Source: Scholar's compilation

Table 7.3: Variables Signs Obtained in the Estimation of Probit Model for Yellareddygudem

Variable	Signs obtained in estimation
awarecis= Awareness on CIS	Positive
purchcis= Purchased CIS	Negative
awarenais= Aware of NAIS	Positive
fage= Household head's age	Negative
farmexpe= Farm experience	Positive
ffamilysize= Farmer family size	Positive
feducation= Farmer education	Positive
farmsize= Farm size	Negative
flandpositon= Farm land position	Negative
flandquality= Farm land quality	Negative
irrigationsource= irrigation source	Negative
livestockvalue= Livestock value	Negative
tfarmincome= Total farm income	Positive
costofculti= Cost of cultivation	Positive
sourceagrifinance=Sources of finance	Positive
croplosscauses= Crop loss causes	Negative
sourcesriskmiti= Risk mitigation source	Positive
sourcescisaware= Sources of CIS awareness	Negative
claimdifficult= Claim difficulty	Negative
riskmitiothercis= Other than CIS risk mitigation tactics	Negative
bankersrole= Banker's role in CIS	Positive
premiumafford=Premium affordability	Negative

Source: Scholar's estimation

Table 7.4: Variables Signs Obtained in the Estimation of Probit Model for Chelmareddygudem

Variable	Signs Obtained in Estimation
awarecis= Awareness on CIS	Positive
purchcis= Purchased CIS	Negative
awarenais= Aware of NAIS	Positive
fage= Household head's age	Negative
farmexpe= Farm experience	Positive
ffamilysize= Farmer family size	Positive
feducation= Farmer education	Positive
farmsize= Farm size	Negative
flandpositon= Farm land position	Negative
flandquality= Farm land quality	Negative
irrigationsource= Irrigation source	Negative
livestockvalue= Livestock value	Negative
tfarmincome= Total farm income	Positive
costofculti= Cost of cultivation	Positive
sourceagrifinance=Sources of finance	Positive
croplosscauses= Crop loss causes	Negative
sourcesriskmiti= Risk mitigation sources	Positive
sourcescisaware= Sources of CIS awareness	Negative
claimdifficult= Claim difficulty	Negative
riskmitiothercis= Other than CIS risk mitigation tactics	Negative
bankersrole= Banker's role in CIS	Positive
premiumafford=Premium affordability	Negative

Source: Scholar's estimation

Table 7.5: Summary Statistics of Variables of Probit Model for Yellareddygudem

Variable	Mean	Std. Dev.
awarecis	0.25	0.43
purchcis	0.20	0.40
awarenais	0.06	0.24
fage	48.47	14.10
farmexpe	26.98	14.81
ffamilysize	4.10	1.18
feducation	0.91	1.28
farmsize	8.27	4.73
flandpositon	1.26	0.44
flandquality	1.80	0.74
irrigationsource	1.11	1.01
livestockvalue	1.17	1.21
tfarmincome	2.91	3.57
costofculti	1.08	1.18
sourceagrifinance	1.44	0.89
croplosscauses	1.81	1.44
sourcesriskmiti	2.53	2.09
sourcescisaware	3.53	2.09
claimdifficult	0.27	0.45
riskmitiothercis	3.42	1.87
bankersrole	0.21	0.41
premiumafford	0.28	0.47

Source: Scholar's Estimation

7.4 Results and Discussions

Table 7.5 provides the summary statistics of the study variables that were used (Probit model for Yellareddygudem) to determine the determinants of crop insurance demand in the

Yellareddygudem village of the Nalgonda District. The average age of the farmers surveyed in the village is 48.47 years, the mean farm experience is 26.98 years, and their standard deviations are 14.10 and 14.81 years, respectively. The average family size and education level are 4.10 and 0.91, respectively, with a standard deviation of 1.18 and 1.28. The average size of a farm is 8.27 acres, with a standard deviation of 4.73 acres. The mean livestock income and total income are respectively 1.17 and 2.91 lakhs, with standard deviations of 1.21 and 3.57 lakhs. The average cost of cultivation is 1.08 per acre, which equates to Rs10,800 per acre.

Table 7.6: Summary Statistics of Variables of Probit for Chelmareddygudem

Variable	Mean	Std. Dev.
awarecis	0.27	0.44
purchcis	0.13	0.34
awarenais	0.05	0.21
fage	49.04	13.23
farmexpe	28.08	13.52
ffamilysize	4.18	1.72
feducation	0.31	1.18
farmsize	1.28	0.59
flandpositon	1.01	0.14
flandquality	1.81	0.75
irrigationsource	1.14	0.76
livestockvalue	0.78	1.30
tfarmincome	2.12	3.87
costofculti	0.92	1.52
sourceagrifinance	1.63	0.89
croplosscauses	1.49	1.03
Sourcesriskmiti	2.56	2.21
sourcescisaware	4.07	2.11
claimdifficult	0.25	0.43
riskmitiothercis	3.33	1.67
bankersrole	1.80	0.97
premiumafford	0.20	0.40

Source: Scholar's Estimation

The summary statistics in Table 7.6 show the variables that were used (Probit model for Chelmareddygudem) to determine the determinants of farmers' knowledge of crop insurance in the Chelmareddygudem village of the Nalgonda District. The average age of the farmers surveyed in the village is 49.40 years, the average farm experience is 28.08 years, and their standard deviations are 13.23 and 13.52 years, respectively. The average family size and education level are 4.18 and 1.91, respectively, with a deviation of 1.72 and 1.28. The average size of a farm is 1.25 acres, with a standard deviation of 0.59. Livestock production and total income have mean values of 0.78 and 2.12 lakhs, respectively, with standard deviations of 1.30 and 3.87 lakhs. The average cost of cultivation per acre is 0.92 (9200).

Table 7.7: Combined Probit model results of determinants of demand for crop insurance for both rainfed and irrigated ecosystems

Purchcis	Coef.	Std. Err.	z	P>z
fage	.0000232	.0105817	0.00	0.998
farmexpe	-.0118366	.0099861	-1.19	0.236
awarecis	1.686845	.20452	8.25	0.000*
ffamilysize	-.0232665	.0766562	-0.30	0.761
feducation	.0430887	.0812724	0.53	0.596
farmsize	.0373055	.0206403	1.81	0.071***
awarenais	.9771271	.3490897	2.80	0.005**
flandposition	.000407	.2959035	0.00	0.999
flandquality	-.004114	.1316159	-0.03	0.975
irrigationsource	-.1839784	.1231711	-1.49	0.135
livestockvalue	.0884339	.0723	1.22	0.221
tfarmincome	-.0410176	.0298519	-1.37	0.169
costofculti	.0851102	.0614708	1.38	0.166
sourceagrifinance	.103973	.1078737	0.96	0.335
croplosscauses	.1553877	.0716565	2.17	0.030**
sourcesriskmiti	.1255349	.0460249	2.73	0.006***
sourcescisaware	.0458366	.0475283	0.96	0.335
claimdifficult	.3183383	.2189535	1.45	0.146
riskmitiothercis	-.1058917	.0594128	-1.78	0.075***
bankersrole	.0137388	.2447969	0.06	0.955
premiumafford	.0339661	.2288353	0.15	0.882
_cons	-2.241152	.7333438	-3.06	0.002**

Number of observations = 430
Log likelihood = -109.15
LR chi2(21) = 163.76
Prob > chi2 = 0.0000
Pseudo R2 = 0.82

Source: Scholar's own estimations from the primary data
Notes: *, ** and *** represent level of significance at 1%, 5% and 10% respectively

Table 7.8: Probit Results of Determinants of Demand for Crop Insurance in Rainfed Ecosystem

purchcis	Coef.	Std. Err.	z	P>z
fage	.007216	.0176558	0.41	0.683
farmexpe	-.0192763	.0155515	-1.24	0.215
awarecis	2.233014	.4029817	5.54	0.000 *
ffamilysize	-.1498226	.1812032	-0.83	0.408
feducation	.0740888	.1403564	0.53	0.598
farmsize	.0097026	.0382181	0.25	0.800
awarenais	1.729671	.5833636	2.96	0.003**
flandposition	-.3151475	.4076621	-0.77	0.439
flandquality	-.1378097	.2222942	-0.62	0.535
irrigationsource	-.2729598	.1696896	-1.61	0.108
livestockvalue	-.1078437	.1449812	-0.74	0.457
tfarmincome	-.079803	.0516913	-1.54	0.123
costofculti	.2952209	.1730349	1.71	0.088
sourceagrifinance	.4269715	.1643513	2.60	0.009***
croplosscauses	.2209167	.1008731	2.19	0.029**
sourcesriskmiti	-.0306975	.0803128	-0.38	0.702
sourcescisaware	.0851952	.0747457	1.14	0.254
claimdifficult	-.2679698	.3586532	-0.75	0.455
riskmitiothercis	-.2387896	.0983809	-2.43	0.015**
bankersrole	-.4316938	.3736628	-1.16	0.248
premiumafford	.9770962	.3580878	2.73	0.006**
_cons	-1.220808	1.287105	-0.95	0.343

Number of observations = 215
Log likelihood = -46.572255
LR chi2(21) = 119.23
Prob > chi2 = 0.0000
Pseudo R2 = 0.7614

Source: Scholar's Estimation
Notes: *, ** and *** represent significant at 1%, 5% and 10% respectively

Table 7.9: Probit Results for Determinants of Demand for Crop Insurance in Irrigated Ecosystem

purchcis	Coef.	Std. Err.	z	P>z
fage	.0067059	.0251308	0.27	0.790
farmexpe	-.050397	.0269557	-1.87	0.062***
awarecis	3.417142	.8281853	4.13	0.000*
ffamilysize	-.0860685	.131512	-0.65	0.513
farmsize	-.1688144	.4316746	-0.39	0.696
awarenais	1.236009	.8913262	1.39	0.166
flandposition	.0951624	15.67777	0.01	0.995
flandquality	-.255938	.2815108	-0.91	0.363
irrigationsource	-.4431654	.4939256	-0.90	0.370
livestockvalue	.1919988	.2811939	0.68	0.495
tfarmincome	-.2445864	.1581279	-1.55	0.122
costofculti	.2466548	.1458768	1.69	0.091***
croplosscauses	-.1160677	.2213693	-0.52	0.600
sourcesriskmiti	.5462131	.1532842	3.56	0.000*
sourcescisaware	-.3118041	.1391682	-2.24	0.025**
claimdifficult	.6101916	.5567833	1.10	0.273
riskmitiothercis	-.1195363	.1425557	-0.84	0.402
bankersrole	1.392502	.694187	2.01	0.045**
premiumafford	-2.59576	.7300769	-3.56	0.000*
_cons	-.4382341	15.73934	-0.03	0.978

Number of observations = 215
Log likelihood = -27.818852
LR chi2(20) = 110.42
Prob > chi2 = 0.0000
Pseudo R2 = 0.6949

Source: Scholar's estimation
Notes: *, ** and *** represent level of significant at 1%, 5% and 10% respectively

The Probit model is estimated to classify the features that control the demand for crop insurance schemes for the sample villages individually and two villages together. The estimates of the Probit Model for crop insurance demand determinants shown in Table 7.7, 7.8 and Table 7.9 reveal how the independent variables are associated with the dependent variable in the selected villages.

Table 7.7 reveals the factors affecting the crop insurance demand for two villages taken together. The variables, awareness of crop insurance schemes, farm size, crop loss causes, sources of risk mitigation, and other than crop insurance risk mitigation tactics have jointly determined the crop insurance demand. The overall model is best fitted on account of considering both the corresponding probability values and pseudo R^2. The valve of coefficient of determination 0.82 means 82 percent of variation in the dependent variable is explained by the independent variables. This confirms the goodness of fit of the model estimated for two villages together. In addition, the significant variable coefficient values reveal that they are positively associated with the dependent variable except the variable other than crop insurance risk mitigation tactics.

Age had a positive coefficient among socioeconomic variables, but it was a minor determinant. This is a good sign because farmers are more likely to ensure their crops as they get older (Fahad et al., 2018). Farmers' age is positively related to the dependent variable, but it is not a significant variable in explaining and determining crop insurance demand in both study villages, despite the fact that it is in tangent with it (Fahad et al., 2018; Sherrick et al., 2004). The result, on the other hand, was in direct opposition to the results of (Enjolras & Sentis, 2020; Aidoo et al., 2014). According to the report, older farmers are less likely to insure their crops than younger farmers. This may be due to the fact that older farmers are skeptical of insurance schemes and modern adoption approaches because they are incompatible with conventional risk management strategies.

Farm experience is negatively associated with crop insurance demand and is significant at the 10% level in irrigated ecosystems (similar to Fahad et al., 2018), but it is not statistically significant in rainfed ecosystems (Table 7.8). As a result, farmers with more farming experience are less likely to insure their crops, as demand for crop insurance decreases. This may be as a consequence of knowing and following better traditional risk mitigation strategies by experienced farmers. Farmers' awareness of crop insurance is positively associated with the demand for crop insurance and it is found as a significant variable at 1 percent for the determination of the dependent variable. This is interpreted as the more awareness of crop insurance programme, the more the demand for crop insurance. But there is still a need to enhance the farmers' awareness level of crop insurance schemes (Swain, 2014).

Household size is not statistically significant but negatively related to the farmers' demand for crop insurance between the two villages in the state of Telangana. This means that as an insured farmer's household size increases by one male, the probability of farmers ensuring a crop or farm reduces by 0.14 in the village of Yellareddygudem and by 0.08 in the village of Chelmareddygudem respectively. For the coefficient signs, this finding agrees with Falola et al. (2013) and Dansoabbeam et al. (2014), but not for the variable's importance.

Farmers' educational level has positively affected their willingness to ensure their crop and influenced crop insurance demand between two sample villages, but not a statistically significant regressor. This means that the higher a farmer's educational level, the more able they are to insure their crop. This was consistent with previous results from Piyasiri and Ariyawardana (2002), Falola et al. (2013), Aidoo et al. (2014), and Dansoabbeam et al. (2015). (2014). The results may be clarified by the fact that, according to Enete and Igbokwe (2009), a farmer with formal education is able to critically analyze and choose between technologies. Training, on the other hand, had no impact on farmers' ability to pay for crop insurance. This may be due to the fact that highly trained people choose to work in the manufacturing and service sectors and are thus not interested in agriculture production.

The farm size of the cultivated area is not a statistically significant variable in both the villages and has negatively affected the ability of a farmer to ensure their crops in the village of Chelmareddygudem, and is positively correlated in Yellareddygudem. As a consequence, the bigger a crop field is, the more difficult it is for a farmer to insure his or her farm in an irrigated ecosystem. According to the results, the probability that a farmer can ensure his farm is in the rainfed environment increases by 0.16 as the size of the cultivated area increases by one acre. This contradicts Kumar et al. (2011)'s findings for the irrigated ecosystem and supports the findings for the rainfed ecosystem. They said that crop area size has a negative impact on crop insurance willingness to pay.

The total farm income does not have a huge impact on a farmer's ability to insure his farm. It did have a negative effect on crop insurance demand. These observations, however, contradict Dansoabbeam et al (2014). They found that a farmer's willingness to insure his or her cocoa farm was significantly influenced by cocoa income. This may be due to the fact that farmers' farm

income is spent in a variety of ways, including family consumption, cultural and traditional rituals, repayment of non-institutional and institutional loans, and so on. By the time crop insurance firms send out reminders to sign up for plans, farmers' financial resources have been exhausted. Crop insurance is also required for loanee farmers but optional for non-loanee farmers, so demand is determined regardless of farm income.

Farmers' demand for crop insurance to pay for crop insurance, on the other hand, has a negative impact on farm profits. Thus, if a farmer's income increased by one rupee, the sum they would be willing to pay in Yellareddygudem and Chelmareddygudem would decrease by 0.07 and 0.24 rupees, respectively.

Income from other sources, particularly livestock, is not a significant determinant and has had a negative impact on farmers' willingness to ensure their crops in a rainfed ecosystem, but it is positively associated with the dependent variable in an irrigated ecosystem. This may be clarified by the fact that farmers diversify their sources of income and, as a result, are less likely to cover and pay for crop insurance. Farmers who earn a higher percentage of their income from livestock have a greater sense of protection and risk tolerance than other farmers.This may be the reason for the negative relationship between livestock income and dependent variables in the rainfed ecosystem. It is also interpreted as the rainfed ecosystem. Farmers largely depend on livestock income as a secondary source of farm income which protects them from the unexpected risks in agriculture production.

The total cost of cultivation is the variable that is positively associated with the dependent variable demand for crop insurance and significant at 10 percent level whose corresponding probability values are 0.091 in an irrigated ecosystem and it is not a significant variable in a rainfed ecosystem. The positive sign indicates that a rise in cultivation costs has led to increased demand for crop insurance between two ecosystems. One more main factor crop loss cause is affecting crop insurance demand, which is positively associated. This means that if the number of crops lost as a result of this rises, the number of farmers who purchase crop insurance will rise as well between the two study villages.

The sources of crop insurance awareness have been positively associated with the crop insurance demand. This is interpreted as an increase in crop insurance awareness, as well as an increase in crop insurance demand between the two study villages. Lastly, the most important variable, premium affordability, is a statistically significant factor in affecting the crop insurance demand between both villages. However, in two ecosystems, the relationship between insurance demand and premium affordability is different. In an irrigated ecosystem, it is negatively related to crop insurance demand, but in a rainfed ecosystem, it is positively related. The variables farm experience, farmers' understanding of crop insurance, cost of cultivation, crop insurance as a risk reduction method, sources of crop insurance awareness, and premium affordability decide the dependent variable demand for crop insurance.

Overall, considering the Pseudo R^2 value of 0.6949 for irrigated ecosystem and 0.7614 for rainfed ecosystem, we can say that the models are good fitted and the independent variables jointly explain well the dependent variable in two study villages. The corresponding probability values of LR Chi2 are found significant in the model for both the villages.

7.5 Summary

This chapter 7 has examined determinants of demand for crop insurance based on field data from two sample villages in Telangana. The chapter started with the definition of crop insurance demand, and later we explained the methodology including data and econometric models of Probit model used in the chapter. This chapter discussed the various factors that affect different components of crop insurance demand which includes farmer education, farm experience, age, farmers awareness on crop insurance, farmer family size, farmers secondary occupation, farmers awareness on NAIS, farmer land position, farmland quality, irrigation source, income from livestock, total farm income, cost of cultivation, crop loss causes, crop insurance as a sources of risk mitigation, sources of CIS awareness, claiming difficult, risk mitigation other than CIS, bankers role, and premium affordability etc. Econometric estimation techniques were used for this purpose. It also discussed the significance and relation of those variables with the dependent variable in the model. The analysis was done for both irrigated and rainfed ecosystems using the sample data collected in two sample villages of Nalgonda district in Telangana. Some findings are summarized as follows:

- Farm experience is found to be negatively associated with crop insurance demand and it is significant at the 10% level. This indicates that farmers with more farming experience are less likely to insure their crops, as demand for crop insurance decreases. This may be as a consequence of knowing and following better traditional risk mitigation strategies by experienced farmers. Farmers' awareness of crop insurance is positively associated with the demand for crop insurance and it is found as a significant variable at 1 percent for the determination of the dependent variable.
- Household size is not statistically significant but negatively related to the farmers' demand for crop insurance between in the sample region of Telangana.
- The educational level is low in the sample region. But farmers' educational level has been observed to be positively affecting their willingness to ensure their crop. This means that the higher a farmer's educational level, the more able they are to insure their crops. This result was consistent with results of some studies like Piyasiri and Ariyawardana (2002), Falola et al. (2013), Aidoo et al. (2014), and Dansoabbeam et al. (2015, 2014). A farmer with formal education is able to critically analyze and choose between technologies.
- The farm size of the cultivated area was found to be not statistically significant variable in both the villages and it has negatively affected the ability of a farmer to ensure their crops in Chelmareddygudem (irrigated), and is positively correlated in Yellareddygudem (rainfed). As a consequence, the bigger a crop field is, it is less likely for a farmer to insure his or her farm in an irrigated ecosystem. This contradicts Kumar et al. (2011)'s findings for the irrigated ecosystem and supports the findings for the rainfed ecosystem.
- Farmers' understanding of crop insurance is positively correlated with crop insurance demand, with a significance level of 1% for the dependent variable determination.
- The total farm income is observed to have a negative effect on crop insurance demand. This indicates that higher income and rich farmers will demand less crop insurance. This result, however, contradicts Dansoabbeam et al (2014). The total cost of cultivation and the sources of crop insurance awareness were having positive impact on the crop insurance demand.

Chapter - 8

Summary and Conclusion

8.1 Introduction

This final chapter is organized into four sections for a systematic presentation: Summary, major findings, policy implications and suggestions, limitations and future research possibilities.

Agriculture is generally regarded as a significant economic field. It is vulnerable to a number of natural disasters. Agricultural production decisions, pesticide use decisions, farming practices decisions, plant pattern and other decisions all rely heavily on insurance as a risk management tool. To protect the agricultural sector in advanced market economies, government officials launched all-risk crop insurance schemes. However, since farmers have the lowest risk-bearing ability, such a mechanism does not exist in less developed or developing countries. Although sharecropping is a common strategy in developing countries to protect peasants from crop losses, it only applies to peasants who are landless or partially landless. Crop losses do not spare small and medium-sized growers. Agricultural insurance is a more efficient mechanism for addressing the issue, as well as a more institutionalized tool. Crop insurance increases farmers' financial stability thereby lowering direct and indirect costs to the national economy. In India, crop insurance is required for farmers who borrow money from banks and other financial institutions. In 1985, India's government implemented the Comprehensive Crop Insurance Program, which made crop insurance mandatory. The “National Agricultural Insurance Scheme” has taken the place of CCIS (Comprehensive Crop Insurance Scheme).

The National Agriculture Insurance Scheme of 2000 was designed to make substantial changes to the crop insurance programme that had been in effect since the 1999-2000 Rabi season, with varying results. The CCIS, which mandated insurance for loan farmers and producers of restricted crops on a voluntary basis for non-loaned farmers, was the immediate impetus for reform. This insurance policy, which included farmers and governments, did not work out.

Crop insurance is a risk-shifting method that could be more effective in protecting all types of growers, and its use as a risk-management tool has exploded in recent years. Natural disasters affect farmers in various ways. According to the operating guidelines of various crop insurance

schemes, the following have been the key targets of various crop insurance schemes since the beginning of the crop insurance systems in India.

As per NAIS guidelines the key targets are "(i) to provide insurance coverage and financial assistance to farmers in the event that one or more of the notified crops is destroyed by natural disasters, pests, or diseases; (ii) to assist farmers in implementing innovative and sustainable farming methods, high-value inputs, and cutting-edge agricultural technology; (iii) to assist and stabilize farmers' farm incomes in order for farmers to continue farming; and (iv) to increase credit availability to India's agriculture sector".

As a consequence, the government of India has been working to provide crop insurance in India since its independence, involving state governments and union territories. From the review, it is found that only very few studies are available on the present topic and hence, a study on crop insurance of United Andhra Pradesh with a particular emphasis on Telangana assumes important.

With the above background and motivation, "the study began with four main objectives as follows:

1. To analyze the performance and development of the National Agriculture Insurance Scheme in India in general and Telangana and United Andhra Pradesh in particular.
2. To evaluate the determinants of farmers' participation in crop insurance of major districts in Telangana State, United Andhra Pradesh and major states in India.
3. To examine the level of farmers' perception, awareness, and determinants of farmers' awareness of crop insurance schemes in selected sample villages of Telangana State.
4. To examine the factors influencing the demand for crop insurance products in selected sample villages of Telangana State".

All of the above goals were examined in Chapter 4, 5, 6, and 7, using both secondary and primary data. The secondary data set was used to analyze the first two objectives, while the primary data set was used to analyze the remaining two objectives. The primary data set was obtained from two villages in the Nalgonda district of Telangana state of India, each of which belongs to one of two ecosystems: rainfed or irrigated. The study area includes Chelmareddygudem village in Anumula mandal, which represents an irrigated ecosystem, and

Yellareddygudem village in Narkatpally mandal, which represents a rainfed ecosystem. A pre-tested survey form was used to collect all of the primary data at the household level. Introduction items were given in Chapter 1 followed by the review of literature in Chapter 2.

8.2 Major Findings: Chapter-wise

Some major findings in the core chapters of the study are given below:

Chapter 4 examined the performance of the National Agriculture Insurance Scheme (NAIS) at the national level and for the state of United Andhra Pradesh including Telangana using secondary data obtained from AICIL, Regional Bank, Hyderabad Region. The National Agriculture Insurance Scheme of 2000 was designed to make substantial improvements to crop insurance schemes that had been in place since the 1999-2000 Rabi season, with varying degrees of success. The Comprehensive Crop Insurance Scheme (CCIS) 1985, which offered insurance mandatorily to loanee farmers and voluntarily to non-loanee farmers to producers of small crops, was the immediate impetus for the reform. This insurance scheme was not effective in covering farmers and states. The overall number of ranchers covered had risen from 51.87 lakhs in 1994-1995 to 61.97 lakhs in 1998-1999. Furthermore, participation in CCIS programs remained very poor, with less than 1% of potentially insurable acreage enrolled, ranging from 82.44 lakh hectares in 1994-95 to 101.26 lakhs in 1998-99. In contrast, the experience under the 1994-95 act has been frustrating, and although participation did not increase, the program's target of 50 percent participation was never met.

To address the issue of low farmer participation and coverage of the region under previous schemes, the NAIS appeared to be very appealing. The region protected by NAIS as a percentage of GCA of India increased from 7.55 percent in 2000 to 16.05 percent in 2004, and it was reaching to a high share of 18.02 percent in 2009. Till 2013, the share in GCA for the country had been above 11% and it dropped to 4.29 percent for some reasons. The total absolute number of number of farmers covered by NAIS in India had been increasing over time till 2013, with higher proportion during Kharif season than Rabi season in many years. In India, the percentage of total farmers benefited by NAIS was 41.55 percent in 2000, 40.67 percent in 2010, 40.51 percent in 2002, and a very poor (0.75 percent only) in 2014.

In all years during 2000-01 to 2012-13, the absolute area protected by the NAIS in United Andhra Pradesh has been lower in Rabi than in Kharif season. The share of area covered under the NAIS in GCA in United Andhra Pradesh was about 20% in 2000-01, which doubled to about 40% in 2009-10 and it marginally fell to 16% in 2012-13. In terms of number of farmers covered under the NAIS of UAP, Kharif season had been having higher number than Rabi season every year. For example, the number of farmers covered in NAIS in UAP during the Kharif season was 3050.75 lakhs in 2009-10 compared to 297.07 lakhs in Rabi season. The percentage of farmers benefitted under the NAIS scheme was the highest (44.52 percent) in 2008-09. During Rabi season, 39.26 percent of farmers was benefited in 2011-12 and it was higher compared to other periods in UAP.

The chapter 5 examined the determinants of farmers' participation in NAIS at the India level in general, and in United Andhra Pradesh (including Telangana) in particular. The study used secondary data on the variables included in the analysis. The secondary data set was obtained from the AICIL regional branch of Hyderabad from the period 1999-2000 to 2012-13. The data obtained was prepared as a balanced panel comprising the major states panel at India level and major districts in the United Andhra Pradesh level. This chapter adopted the econometric estimation of Probit model. The number of farmers covered in NAIS or farmers' participation in crop insurance which is a dependent variable. Area covered, the sum insured premium subsidies, and claims reported are the independent variables in the study. Important results and findings of chapter 5 are given below.

- The two variables, Area Insured (AI) and Sum Insured (SI), were found to be significant at 1% level which are positively affecting the number of farmers' participation in NAIS for the major states panel in India during the Kharif season. Even though TPS (Total premium subsidy) and CA (Claim amount) are positively impacting the number of farmers covered, both variables are found to be not statistically significant.
- The results showed that as the Area which is insured and the Sum Insured increase, the Number of growers participated in NAIS gets positively impacted by this for India during Kharif season.
- It is observed that the three variables, Area Insured, Sum Insured, and the Total Premium Subsidy, are positively impacting the total number of growers protected or participated in

the NAIS. The claim amount is also seen positively affecting the number of farmers covered but it is not statistically significant for major states panel during the Rabi season.

- In UAP (Undivided Andhra Pradesh), for Paddy crop districts panel for Rabi season, three variables (Area Insured, Sum Insured and the Claim Amount) are positively affecting the number of farmers covered and are significant at 1% level. The other variable (i.e., Total Premium Subsidy) is negatively affecting the number of farmers covered but it is not statistically significant and hence it can be ignored. Further, apart from the random effects model, the fixed effect model also reconfirms the robustness.
- Similarly, for Paddy crop districts panel for Kharif season in UAP, three variables (Area Insured, Sum Insured and the Total Premium Subsidy) are found to be positively impacting the Number of Farmers covered and also the P-value is statistically significant. However, one variable (Claim amount) is positively affecting but not statistically significant.
- The two variables (Area insured and the Sum insured) are significant at 1% level. The other variable (Total Premium Subsidy) is found to be having a negative impact but it is not significant. The last variable (Claim amount) is found to be positively impacting the number of farmers covered but it is not statistically significant for the cotton crop during the Kharif season in UAP.

Chapter 6 examined the farmers' perception and awareness on crop insurance based on the sample data from field surveys. The primary data set was collected from 430 farmers (215 from each village) in two villages: Yellareddygudem (representing the rainfed ecosystem) of Narkatpally mandal and Chelmareddygudem (representing the irrigated ecosystem) of Anumula mandal of Nalgonda district in Telangana. Some important observations and findings are given below.

- According to the primary data, the awareness level of farmers on the crop insurance was very low in the sample villages of Telangana. Approximately 75% of farmers in study villages were unaware of crop insurance. Crop insurance policies were only known by 25% of the households. Only those farmers who had previously taken advantage of agricultural credit from banks and those with a large family size were aware of and understood crop insurance better.

- Only 7% of sample growers aware of the presence of AICIL, and 93 percent were unaware of the procedure for obtaining crop insurance. Moreover, about 90 percent of the farmers are not aware of the premium amount paid for the crops while they are switching the crop insurance product. About 70-90 percent of farmers in both ecosystems do not know about crops and the risks covered in crop insurance products and premium subsidies provided by union and state governments.
- More than 65 percent of the insurance beneficiaries at Yellareddygudem (representing the rainfed ecosystem) and 77 percent of the beneficiaries in Chelmareddygudem (irrigated ecosystem) revealed that bank compulsion was the major determinant or motivation to subscribe to the NAIS.
- About 40 percent of the growers in both villages have received awareness on crop insurance from print and electronic media like newspapers, radio, and television. The banks played a key role in disseminating awareness on crop insurance, i.e., 31.63 percent in Yellareddygudem village and it is 11.63 percent in Chelmareddygudem. Insurance companies and agriculture extension personnel played a minor role in bringing crop insurance products to the attention of farmers.
- Farmers' response to premium subsidies revealed that 75 percent of the farmers in Yellareddygudem and 82.79 percent of farmers in Chelmareddygudem villages expected full premium subsidy on all crops and perils. More than 93 percent of them opposed the involvement of the private sector in the crop insurance business and felt it is not healthy for the farming community.
- About 50 percent of farmers in both villages are not satisfied with the number of crops being covered in existing crop insurance products. More than 70% of growers in sample villages said they are dissatisfied with the sum insured.
- Unlike life insurance and motor vehicle insurance, crop insurance holders will not be given any policy holding document or bond, even though farmers purchased crop insurance. Hence, more than 70 percent of farmers are not satisfied with the policy documentation procedure in crop insurance.
- The present crop insurance schemes in India and its states have the following area approach to crop loss assessment. About 80-85 percent of farmers feel that the area

approach of loss assessment is not satisfactory and which does not consider individual loss in farming.

- Yellareddygudem farmers (in the rainfed village in this study), have been growing the cotton crop, which is considered to be very volatile to climate shocks and other shocks. Hence, 49.30 percent of the farmers suggested that the crop loss assessment would be on an individual basis, but it is 31.63 percent in Chelmareddygudem village (irrigated ecosystem).
- It is found that 37.21 percent of farmers in Yellareddygudem (rainfed) and 41.86 percent of farmers in Chelmareddygudem (irrigated region) felt that bank loans will help them to get out of the crop loss problem and make it possible to invest in agriculture production in the next crop season or year.
- Nearly 52 percent of farmers in Yellareddygudem village (rainfed) and 45.12 percent of farmers in Chelmareddygudem village (irrigated) have been anticipating the arrival of rural insurance agents, who can enlighten the benefits, terms, and conditions of insurance products.
- On the issue of the determinants of farmers' awareness of crop insurance, the results depicted that farmers' family size, income from livestock, crop insurance as a good source of risk mitigation and affordability of premiums are seen as significant determinants in the rainfed ecosystem (Yellareddygudem). Explanatory variables of sources of agriculture finance, crop loss causes, claims difficulty and premium affordability are significantly determining the farmers' awareness of the crop insurance in Chelmareddygudem village.

Chapter 7 examined determinants of demand for crop insurance based on field data from two sample villages in Telangana. This chapter discussed the various factors that affect different components of crop insurance demand which includes farmer education, farm experience, age, farmers awareness on crop insurance, farmer family size, farmers secondary occupation, farmers awareness on NAIS, farmer land position, farmland quality, irrigation source, income from livestock, total farm income, cost of cultivation, crop loss causes, crop insurance as a sources of risk mitigation, sources of CIS awareness, claiming difficult, risk mitigation other than CIS, bankers role, and premium affordability etc. Econometric estimation techniques of Probit model

were used for this purpose. The analysis was done for both irrigated and rainfed ecosystems using the sample data collected in two sample villages of Nalgonda district in Telangana. Some findings are summarized as follows:

- Farm experience is found to be negatively associated with crop insurance demand and it is significant at the 10% level. This indicates that farmers with more farming experience are less likely to insure their crops, as demand for crop insurance decreases. This may be as a consequence of knowing and following better traditional risk mitigation strategies by experienced farmers. Farmers' awareness of crop insurance is positively associated with the demand for crop insurance and it is found as a significant variable at 1 percent for the determination of the dependent variable.
- Household size is not statistically significant but negatively related to the farmers' demand for crop insurance between in the sample region of Telangana.
- The educational level is low in the sample region. But farmers' educational level has been observed to be positively affecting their willingness to ensure their crop. This means that the higher a farmer's educational level, the more able they are to insure their crops. This result was consistent with results of some studies like Piyasiri and Ariyawardana (2002), Falola et al. (2013), Aidoo et al. (2014), and Dansoabbeam et al. (2015, 2014). A farmer with formal education is able to critically analyze and choose between technologies.
- The farm size of the cultivated area was found to be not statistically significant variable in both the villages and it has negatively affected the ability of a farmer to ensure their crops in Chelmareddygudem (irrigated), and is positively correlated in Yellareddygudem (rainfed). As a consequence, the bigger a crop field is, it is less likely for a farmer to insure his or her farm in an irrigated ecosystem. This contradicts Kumar et al. (2011)'s findings for the irrigated ecosystem and supports the findings for the rainfed ecosystem.
- Farmers' understanding of crop insurance is positively correlated with crop insurance demand, with a significance level of 1% for the dependent variable determination.
- The total farm income is observed to have a negative effect on crop insurance demand. This indicates that higher income and rich farmers will demand less crop insurance. This result, however, contradicts Dansoabbeam et al (2014). The total cost of cultivation and

the sources of crop insurance awareness were having positive impact on the crop insurance demand.

8.3 Policy Implications and Suggestions

The above findings have a strong bearing on the policies for overall crop insurance performance, development, and implementation in India in general and United Andhra Pradesh (including present Telangana) in particular. Important points are given below:

(i) One of the major stakeholders of crop insurance is bankers. The government should mandate the bankers to inform about the crop insurance schemes and their advantages, crops covered, perils covered, crop-wise premium amount per acre paid by the farmers, etc. So, the farmers' involvement in crop insurance will improve automatically. (ii) The participation of growers in crop insurance policies will also increase by selling the crop insurance products on doorsteps or in the village to the farmers through the insurance agents as to how the life insurance is sold in the market. Insurance farmers will become more aware of crop insurance and the scheme as a result of this type of crop selling, which will increase farmers' participation in crop insurance. (iii) There is no proper documentation procedure in place when farmers purchase crop insurance or when claims are settled. After the subscription of crop insurance, in many cases, farmers will not be given any acknowledgment of insurance taken for the crops and premiums paid and so on. Therefore, the insurance providers should have followed the procedure of documentation and also provide the farmers with an acknowledgment of the receipt of the premium for crops insured. (iv) Timely assessment of crop loss, quick response of insurance personnel to the farmers' complaints and quick settlement of claims are more important aspects for the enhancement of farmers' participation in India and among its states and Union Territories. Therefore, the respective state governments will have to take care of timely crop loss assessment and quick settlement of claims.

(v) Now it's the time for the government to appoint the agriculture offices or agriculture extensional personnel for every village in the nation so that they can educate the farmers continuously not only to purchase crop insurance but also to overcome the different problems associated with agriculture production. (vi) The agriculture education in India should be liberalized to produce a greater number of agricultural graduates to handle the problems arising

in the agriculture sector. An exemption should be given for the appointment of agriculture assistants or persons involved in agriculture promotion activities. The student who has come from an agriculture background will be given an opportunity by providing them with short term orientation and training in agriculture-related activities. (vii) The reintroduction of Ideal Farmers or Progressive farmers will also benefit fellow farmers by inducing and motivating them to take part in crop insurance schemes offered by the AICIL. Further, it also improves the best cultivation practices among farmers. (viii) The majority of crop insurance business is concentrated in the public sector, and private insurance providers are not given free to enter agriculture insurance. Therefore the government may allow the private sector involvement in providing the crop insurance on a regulatory basis. (ix) AICIL has its branches for the crop insurance business in major headquarters or capital cities of the states. It's difficult to monitor the insurance crop insurance business with these limited branches. Since there has been a huge burden on banking sector personnel for their regular business only, hence, they are not focusing on motivating the farmers to take part in crop insurance. Therefore, it is suggested the AICIL starts its zonal offices in different states for the success of crop insurance in India to safeguard the Indian agriculture sector and farmers from losses. (x) To more effectively monitor and enforce insurance schemes, GoI and state governments can maintain or access detailed databases of beneficiary farmers to guarantee that the benefits of schemes meet the targeted beneficiaries. (xi) The Department of Agriculture Cooperation & Farmers Welfare at the national level and Ministries of Agriculture at the state level should take effective action to ensure that the schemes involve a large number of growers and encourage more growers to participate in the schemes irrespective of loanee and non-loanee farmers. (xii) Farmers' awareness of crop insurance is the key determinant for the success of crop insurance stories in any state. Hence, crop insurance service providers can use SMS, hoardings, television, and radios to create awareness of crop insurance. Additionally, in all the notified district villages, the scheme requires sufficient advertisements. The facilities of State Agricultural Extension Officers/UT should be used in addition to audio-visual media. To avoid confusion and misunderstanding in banks, it is equally important to train people who will be involved in collecting premiums, processing declarations, making proposals, etc. (xiii) Training programs and seminars, IA officers' visits to the banks would help clarify the questions, rectify complaints and identify bottlenecks in the smooth

implementation of the system. Pamphlets in participating states/UTs will be distributed to all villages. To this end, the IA will make a short film covering the Scheme's salient features.

8.4 Limitations and Future Research Possibilities

Each effort of research has its own limitations. Some of the limitations applicable to this study are mentioned here. First, the main limitation is data coverage and time period. Actually, a beneficiary's or farmer's behaviour is a dynamic one which needs to be studied over time and space. Studying the farmers' participation in crop insurance at a particular point of time doesn't help to understand the farmers' participation and consciousness of the crop insurance programmes. In this study, we have collected primary data from two diverse regions (irrigated and rainfed or unirrigated) only of Telangana at specific point of time. Second, we have used cross-sectional data to study the specific factors influencing the farmers' awareness and behaviour of sample farmers on crop insurance. But the problem with cross-sectional data is immense. It leads to the problem of heteroscedasticity problems with the endogeneity problem. Thus, the empirical results we get are subject to criticism. However, in any cross-sectional studies, it is very difficult to eradicate that problem. Third, the sample size of primary data used is insufficient to accurately represent the entire population. We interviewed 430 farmers only from two sample villages in Nalgonda district. But this does not include the rest of the farmers in the district's many villages, which is a shortcoming in evaluating and defining the farmers' views, responses, and actions in relation to crop insurance programs in a particular state's economy. Fourth, this study was conducted on only two selected villages, representing two regions of Nalgonda district of United Andhra Pradesh, due to time and financial constraints.

Scope for further research:

The first two objectives of the study focused on the performance of NAIS and determinants of farmers' participation in NAIS in India and United Andhra Pradesh including Telangana. Hence, further research may focus on analyzing the performance of the NAIS for different states in India and it can also compare Indian crop insurance schemes with foreign countries' insurance schemes. Similarly, the new research may also examine the inter-district variations in the performance of crop insurance schemes using secondary data on crop insurance.

- The present study has discussed the determinants of crop insurance demand and awareness of crop insurance in the irrigated and rainfed ecosystem of the two villages from a single district. Hence, the future researchers have an opportunity to undertake the inter-district variations and interstate variations among the determinants of demand for crop insurance and farmers' awareness of it.
- This study has seen only the performance of NAIS at India level and UAP level only. Researchers may undertake further studies on taking the crop insurance season-wise time-series data from the 1978 Pilot Based Crop Insurance Scheme to present Prime Minister Fasal Bhima Yojana.
- Only one stakeholder of the crop insurance business, namely farmers' responses, has been examined in the present research and new research will also have an opportunity to analyse the different stakeholders' responses and views to the crop insurance schemes.
- The problems of adverse selection and moral hazard in crop insurance schemes in India in general and Telangana in particular, have not been discussed in the literature. The research work on this said problem was high in foreign countries but not India. Therefore, it is the first advisable area in crop insurance research in the near future.
- The impact of premium subsidies and government support for the crop insurance sector on acreage response in India is also an important topic for future research.
- The study of weather-based crop insurance schemes and its advantages over the other types of crop insurance schemes in India is also another topic for further research.

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https://agricoop.nic.in

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Annexure – 1: Field Survey Form

Questionnaire/Schedule for Field Survey

on

"Status and Determinants of Crop Insurance Demand: A Study of Telangana"

(As a part of PhD thesis of Mr. Pandaraiah Gouraram)

1. Name of the district: _____ 2. Date of interview: _____
3. Name of the village: _____
4. Name of the investigator: _____
5. Name of the respondent/Head of HHs: _____
6. Whether ST/SC/OBC/GEN: _____
7. Farming experience of respondent (in years) _____

I. Demographic Particulars of Households

Sl. No.	Name	Relation with Head	Gender (M/F)	Age	Education Level	Farming Experience (No. of Yrs.)	Main Occupation	Secondary occupation
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1								
2								
3								
4								
5								
6								
7								
8								
9								

II. Farmer's Landholding Details (in acres)

Plot No.	Name of location or/ and place	Area (Acre)	Land position*	Land quality**	Lease status***	Terms of lease#	Main source of irrigation

Notes:
Land position* = Upper/Medium/Lower land.
Land quality** = Alluvial/sandy/Clay/Loamy/Rocky/Mix
Lease status*** : OW – owned, LI- leased in, Lo- leased out, MI- mortgaged in, MO- Mortgage out
Terms of Lease#: A. Share cropping (50:50), B. Cash rent (Rs per Guntha), C. Kind rent (Specify name of the crop and quantity in kgs per guntha), D. Any other agreement.

i) Current value of land owned (approx.) Rs…….

a) Land cultivated (Acre/Gunta) …….
b) Land put non-agricultural use (Acre/Gunta)……
c) Total land holding (a+b) ……..

ii) If tenant, specify the rate of rent on one acre of land (in Rs.)

S. No	Year	Rent on irrigated land	Rent on non-irrigated land
1	2012-13		
2	2013-14		
3	2014-15		

III. Assets Position of the Sample Household

A) Fixed Assets

Sl. No.	Particulars	Number	Year of purchase/construction	Cost at purchasing time	Current value (Rs.)
1	**House**				
	Thatched				
	Asbestos				
	Concrete roof				
2	Grain storage				
3	Pump sets				
4	Dug wells				
5	Tube wells				
6	TV				
7	Radios				
8	Cycles				
9	2 & 4 Wheelers				
10	Miller				

B) Livestock

Sl. No.	Particulars	Number	Year of purchase/construction	Cost at purchasing time	Current value (Rs.)
1	Bullocks				
2	Cows				
3	Buffalos				
4	Poultry				
5	Sheep/Goat				
6	Pigs				
7					

C) What is your perception regarding rainfall during last three years? (Tick √ mark)

S. No	Year	Adequate	Just normal	Inadequate	Shortage
1	2012-13				
2	2013-14				
3	2014-15				

D) Your cultivable land is: (Put tick √ mark)

1) Irrigated area ☐
2) Semi-irrigated area ☐
3) Rain-fed area ☐
4) Others ☐

E) Tick the sources of irrigation from the following table: (Put tick √ mark)

Canal		Tank		Well		Bore well		Tube-well	

F) What is crop-wise area of cultivation during last three years? (in acres)

S. No	Name of crop	2012-13			2013-14			2014-15		
		Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
1										
2										
3										
4										

G) What is the average yield and income of the farmer per acre? (In Quintals and Rupees)

S. No	Year	Crop name	Kharif	Rabi	Total yield	Price per quintal	Income
1	2012-13						
2	2013-14						
3	2014-15						

H) What is the investment cost of cultivation per acre (in Rs)?

S. No	Year	Crop name	Kharif	Rabi	Total
1	2012-13				
2	2013-14				
3	2014-15				

I) What are the other income sources of the family for last three years? (In Rs.)

S. No	Source of income	2012-13	2013-14	2014-15
1	Income from farming			
2	Income from livestock			
3	Hired labour			
4	Agricultural wages			
5	Non-agricultural wages			
6	Business/Trade			
7	Govt. Services			
8	Others (specify)			
9	Total (1 to 8)			

J) Agriculture finance

i) Did you borrow any money for the purpose of agricultural activities during last three years? Yes/No

ii) Are you a loanee farmer? Yes/No

iii) What are the sources for agriculture finance?

a) Institutional sources

1) Commercial banks _____
2) Regional rural banks _____
3) Co-operative banks _____

b) Non-institutional sources

4) Money lenders _____

If money lender what is the rate of interest on loan? _____

5) Friends/Relatives _____
6) Other Sources _____

K) If the source of agriculture finance is institutional, give details of finance in the table below:

S. No	Year	Crop Season	Amount of loan (Rs)	Rate of Interest	Time and mode of repayment
1	2012-13	Kharif			
		Rabi			
		Total			
2	2013-14	Kharif			
		Rabi			
		Total			
3	2014-15	Kharif			
		Rabi			
		Total			

L) What are the sources of repayment of loan?

1) Sale of agriculture produce _____
2) Sale of land and other assets _____
3) Sale of livestock _____
4) Sale of gold and jewelry _____
5) Repudiation or rejection of loan repayment _____
6) Are you the beneficiary under Andhra Pradesh/Telangana state loan waiver Scheme?

   YES/NO
7) If yes, how many members of the family are benefited under the scheme? ___

IV) Have you experienced any crop loss during last three years?

A) If yes give details of crop loss.

S. No	Year	Season	Crop name	Cause of crop loss	Area cultivated in acres	Expected yield per acre in quintal	Actual yield per acre in quintal	Total loss in Rs.
1	2014-15	Kharif						
		Rabi						

B) What are the main causes of crop loss during last three years? (Put tick √ mark)

Drought		Famine		Floods		Rain shortage		Surplus rain		Earth quake	

C) Is low price of the crop produce? YES/NO

D) Is any farmer of the family committed suicide due to crop loss loan burden during last three years?

YES/NO

E) What are the sources to overcome the crop loss and risk mitigation in agriculture? Tick the options below: (Put tick √ mark)

S. No	Source of risk mitigation/Compensation	Tick below
1	Depends on livestock	
2	Off farm activities	
3	Employees income	
4	Organic farming	
5	Integrated farming	
6	Stop cultivation	
7	Migration to urban area	
8	Crop insurance	

V) If crop insurance is a crop loss compensation/risk mitigation strategy then,

A) Since how many years you know about crop insurance schemes in India? _____

B) Are you aware of National Agriculture Insurance Scheme? YES/NO

C) How do you know about the crop insurance scheme/ National Agriculture Insurance Scheme? Tick on below sources: (Put tick √ mark)

S. No	Source	Tick below	S. No	Source	Tick below
1	Radio		11	SMS	
2	Doordarshan		12	Advertisement	
3	News Papers		13	Insurance Companies	
4	NGOs		14	Insurance Agents	
5	Post Offices		15	Kisansabha	
6	Banks		16	Ideal Farmers	
7	Co-operative Societies		17	Educated Farmers	
8	Implementing Agency		18	Govt. Websites	
9	AIC and Regional Offices		19	PACs	
10	GIC		20	Others	

D) Do you know Agriculture Insurance Company of India Limited? YES/NO

E) Have you availed the NAIS? YES/NO

VI. Details of Crop Insurance during last three years.

S. No	Year	Season	Crop name	Premium paid by farmer	Subsidy	Sum insured	Amount claimed
1	2012-13						
2	2013-14						
3	2014-15						

A) Do you feel claiming of amount in this scheme is difficult? YES/NO

1) If yes, specify the reasons.

_____

2) _____

B) What kinds of risks are covered in this scheme?

_____

_____

C) How many years you have availed this scheme? _____

D) How much premium amount you're paying? (for selected crops)

S. No	Name of the Crop	Premium paid per acre (in Rs:)	Sum insured (in Rs:)	Remarks

E) How many times you have claimed the insurance or indemnity? _____

1) Do you remember in some years you have crop insurance policy and suffered from crop loss, but you have not received and claim? YES/NO
2) Do you remember you did not suffer any crop loss, but you received compensation or money? YES/NO
3) Have you received any other crop loss compensation rather than crop insurance scheme? YES/NO

F) During these many years what is your experience about this scheme?

_____

_____

VII. A) What factors motivated you to take the crop insurance policy or NAIS?

S. No	Source of motivation	Tick below
1	Banks/ financial institutions compulsory	
3	Financial security	
3	Heard of good experience from other farmers	
4	It is good source of risk mitigation in agriculture	
5	Others (Specify)	

B) For what crops you are taking insurance?

Specify the names of the

crop_____

_____

C) If your crops are not insured, what other measures of loss compensation would you like to look forward for aid/ relief?

S. No	Source of non-insured aid or relief	Tick below
1	Sale of fixed assets	
2	Sale of livestock	
3	Depends on friends and relatives	
4	Bank loans	
5	Money lenders	
6	Government relief	
7	Land lease	
8	Co-operative societies	
9	Sale of house/ jewelry	
10	Migration to urban areas	
11	Others (specify)	

D) Which insurance service provider would you select for availing National Agriculture Insurance Scheme?

S. No	Name of service provider	Tick below
1	Rural insurance agent at your door step	
2	Insurance agents	
3	Commercial banks	
4	Co-operative banks	
5	Regional rural banks	
6	Self-help groups	
7	NGOs	
8	Post offices	
9	AIC Regional Offices	
10	Others (specify)	

E) Crop Insurance and premium subsides

1) Do you know central and state governments are providing subsidies to the crop insurance products? YES/NO
2) Do bank employees are informing about the crop insurance policy rules, regulations, premium levels of different crops and its subsidy? YES/NO
3) Do you feel that government have to give full premium subsidy? YES/NO
4) Do you feel that private sector intervention will help and strengthen the crop insurance system in India? YES/NO
5) After premium subsidy, whether premium paying is affordable? YES/NO

F) What is your experience about crop insurance scheme in India? 1 if Satisfactory and 2 for Not satisfactory

S. No	Aspect of crop insurance	Satisfactory(1) or Not satisfactory(2)
1	Crops covered	
2	Sum insured	
3	Premium rate	
4	Premium subsidy	
5	Crop loss assessment	
6	Facilities available at financial institutions	
7	Documentation of policy	
8	Area approach	
9	Indemnity level	
10	Crop Cutting Experiments	
11	Claim procedure	
12	Products and services of crop insurance	
13	Others (specify)	

G) Could you please reveal to what extent you agree with the following statements concerning Crop insurance?

S. No	Statement	Disagree 1	Partially agree 2	Agree 3	Completely agree 4
1	I understand the total crop insurance schemes				
2	I understand how premium level is calculated				
3	I understand the loss assessment carried out				
4	I trust the competence of the company providing it				
5	I was given negative information about this product				
6	I would like to know more about this product and scheme				

H) What are your suggestions for improving crop insurance/ NAIS/ Agriculture Insurance?

S. No	Suggestions	Tick below
1	Cover more crops	
2	Individual crop loss assessment	
3	Reduction in premium rates	
4	Quick settlement of claims	
5	Grampanchayath as unit of loss assessment	
6	Type and fertility of the land is a unit of loss assessment	
7	CCE has to be conducted in the presence of villagers and AOs	
8	More responsible participation of Agriculture Officers	
9	Other (specify)	

I) What extent of agriculture crop loss you are willing to bear (%)_____

J) Are you aware of Weather Based Crop Insurance Scheme? If give details.

S. No	Name of the policy/ Policy	Name of the service provider	Response (YES/NO)
1	Weather Based Crop Insurance Scheme	AICIL	
2	Varsha Bima	AICIL	
3	Weather Insurance	ICICI-Lombard	
4	Weather Insurance	IFFCO-TOKIO	

VIII A) Livestock holding information of the farmer

S. No	Name of livestock	Male no	Female no	Total
1	Cattle			
2	Buffalo			
3	Sheep			
4	Goats			
5	Pigs			
6	Poultry			
7	Horse			
8	Others			
9	Total			

B) Are you aware of livestock insurance schemes in India?

S. No	Name of the Insurance Product	Response of the farmer (YES/NO)
1	Cattle Insurance	
2	Sheep& Goat Insurance	
3	Horse Insurance	
4	Donkey Insurance	
5	Pig Insurance	
6	Poultry Insurance	
7	Camel Insurance	
8	Others	

Any other comments/Opinions

Signature of the farmer (Optional)

Signature of the Surveyor

DETERMINANTS OF CROP INSURANCE DEMAND EMPIRICAL EVIDENCE FROM TELANGANA

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Abstract

The present paper is an attempt to explore the factors that determine the farmers purchasing or not purchasing crop insurance so that it can provide some suggestions to the responsible stockholders mainly to the Telangana state government, bankers and Agriculture Officers of the state to strengthen their exercise to enhance awareness on crop insurance schemes. Study also gives ideas to the supplier of crop insurance mainly to Agriculture Insurance Company of India Limited, its regional offices and commercial ones can adjust their policies to suit the demand of famers based on study outcomes. This study makes use of primary data elicited from the respondents of Nalgonda district through structured questionnaire. In order to get the empirical results statistical and econometrics tools employed namely simple percentages and Probit Regression. Study found that the farmers education level, premium rates, premium subsidies, claims, number of farmers covered determined the crop insurance demand. It also found that the awareness on agricultural insurance schemes is very much poor among the farmers. A surprising fact found from the data that farmers surveyed have the part crop insurance scheme but they are not aware of the same. It recommended that more responsible participation of crop insurance companies, agricultural extension personal and bankers in crop insurance awareness programmes would definitely increase the demand for crop insurance schemes in Telangana and India.

Keywords: ***Crop insurance, Purchasing, Empirical, Agriculture Officers and Telangana.***

I. INTRODUCTION

Production activity in agriculture is quite different than that of production in other sectors of the economy of any country in the world, because agriculture production has been adversely affected by monsoons, weather conditions and lack of crop management practices and other risks. Since the beginning of the farming farmers have been using several tactics to mitigate the risk in agriculture production, they are changing the cropping alteration, depending on off farm activities, informal instrument like evading of highly risk crops, diversification across, minimum support price system and future's markets and crops and across income sources to formal mechanisms like agriculture insurance.

Crop insurance is a one of risk mitigation scheme of caring the farmers against economic losses due to risks that are raised in agriculture called all unforeseen risks beyond their control. It is one technique by which growers can stabilize agriculture income, investment and protect against catastrophic consequence of losses due to natural calamities or inadequate market prices and others.

It not only stabilizes the agriculture income but also assists the growers to continue production activity in agriculture after adverse

agriculture year too. It reduces the shock of agriculture losses by facilitating farmers with a minimum amount of protection.

It blowouts the farming losses over space, time and helps growers make more investments in cultivation. It forms a significant factor of safety-net programs. The size of insurance market can be seen not only as an indicator of economic and agriculture development, but also as an indicator of societal and ethnic fabric of any the social order (CCC, 2009). Pushing the question of premium rate away, there is a universal belief that the administration, management, government and NGOs will come forward to rescue in the aftermath of any disaster.

Unpredictably, the farmers awareness on crop insurance programmes in Telangana has not made much advancement yet the obligation to protect the growers from uncertainty in farming production and income should be of great worry in any agricultural policy. As a consequence of less awareness on crop insurance the demand for crop insurance around the Telangana and India is also less. Crop insurance can be utilized as a successful strategy to mitigate the risk and uncertainty in agriculture.Which encouraged growers to invest, cultivate and produce more without fear of any kind of risks.

Crop Insurance in India: An Introduction

The policy makers in India are concerned about the risk and uncertainty prevalent in agriculture. Work on crop insurance received much attention after India's independence in 1947. However, crop insurance was conceptualized and J.S. Chakravarthi presented a practical scheme suited to Indian conditions as early as in 1920. A book entitled "Agricultural Insurance: A practical Scheme Suited to Indian Conditions" was published in 1920. In this book he proposed a rain insurance scheme for the Mysore state to protect farmers against vagaries of monsoon culminating in drought. The subject of crop insurance was discussed in the Parliament (Central Legislature) the 1947 and then minister of Food and Agriculture, gave an assurance that the feasibility of introducing crop and livestock insurance should be considered by government. Two pilot schemes on crop insurance, prepared by Mr. G.S. Priolkar, an officer on special duty, were circulated to the states for adoption. However, none of the states agreed to implement the schemes, mainly due to paucity of funds. The interest in the subject was rekindled during the 3rd five-year plan (1961 – 1966). However, the working group on agriculture was averse to included crop insurance in the plan. At the same time the government of Punjab proposed the inclination of crop insurance in its state plan and sort financial assistance from the central government (Dandekar 1976)

Crop Insurance Scheme (CIS) 1972-1978:

Based on "Individual Approach" the General Insurance Corporation of India introduced this programme and this covered H-4 cotton in Gujarat and it extended to Paddy, Groundnut. Later this CIS was extended to other states.

Pilot Crop Insurance Scheme (PCIS) 1979-1984:

In the history of Crop Insurance in India this scheme was introduced based on 'Homogeneous Area Approach' by General Insurance Corporation of India. This scheme covered the crops like cereals, millets, oil seeds, cotton, potato, and gram spread across the 13 states but the programme was restricted to loanee farmers.

Comprehensive Crop Insurance Scheme (CCIS) 1985-1998

It had also introduced by GIC based on 'Homogeneous Area Approach'. This scheme covered cereals, millets, oilseeds and pulses spread cross the 15 states and 2 union territories in India,

latter it spills over to five more states in later few years. Scheme was restricted to loanee farmers up to 100% of the crop loan or maximum of 10,000 per farmers.

National Agriculture Crop Insurance Scheme (NAIS) 1999-2000

India's modified crop insurance program which is called as National Agricultural Insurance Scheme is implemented since rabi 1999-2000.Union budget 2002-03 proposed set up of Agricultural Insurance Corporation (AIC) with capital participation from General Insurance Corporation of India (GIC), four public sector general insurance companies viz. 1. National Insurance Co Ltd., 2. New India Assurance Co. Ltd., 3.Oriental Insurance Co. Ltd and 4. United Insurance Co. Ltd., and NABARD. The promoter's subscription to the paid up capital will be: 35% by GIC, 30% by NABARD and 8.75% each by the four public sector general insurance companies. The authorized capital of the new organization will be Rs.1500 crore, while the initial paid-up capital will be Rs.200 crore. National Agricultural Insurance Scheme (NAIS)shall be transferred to the new organization and shall form the core of business to begin with. Transition to actuarial regime will be made over a period of time. The new organization will, in due course of time covers other allied rural/agricultural risk along with crop insurance. The specific objectives of the program are to provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests and diseases. To encourage the farmers to adopt progressive farming practices, high value inputs and improved technology in agriculture.

Review of Literature

Earlier works mainlycovered the following aspects. First is about the important of agricultural insurance, which is well maintained by empirical. Orden (2001) found that the agricultural insurance expands the output of agricultural sector by 0.28-4.1%, he found this results by Using data from the year of 1998 through 2000.Hazell (1986) explained through the data composed in Mexican that the agriculture insurance decisions effectively decrease the probability of low incomes and shift the well-organized mean income standard-deviation frontier upward. Using nationwide. Harbin section data at the farm level, Just, Calvin and Quiggin (1999) recognized the variances between insured and noninsured growers, which insured growers tend to receive adequate anticipated benefits related to the non-insured growers when their revenue is disastrously little caused by unrestrained reasons. The additional one is around the reasons of failure of agricultural insurance markets. Kramer (1986) analyzed the marketplace for crop insurance would fail for the reason that of the lack of government supports and subsidies. The irregular evidence on the other hand, particularly the adversative selection and moral hazard are the foremost reasons of markets failure. Goodwin and Smith 1996, Chamber 1989, Nelson and Loehman 1987, However, Miranda and Glauber (1997) explained in a diverse view on crop insurance market failure. They found, compare to the asymmetric information difficulties, the systemic risk could reason much more serious problem to the private agriculture insurance business.

The many works like mentioned above on crop insurance regularly emphasis on the difficulties on the "supply" side of crop insurance, such as how crop insurance markets run and the associated results instigated by the letdown of markets, and how this insurance schemes benefit growers to mitigate the risk in agriculture production. Yet, the difficult son "demand" side, such as what are the foremost aspects that will

affect the growers to purchase or not to not purchase crop insurance were rarely discussed and there were no studies on this aspect of selected study area. Knowing all these aspects well, we can set up a more operationally, implementation ally successful crop insurance scheme.

II. Objective

1. The main objective of the present paper is to analyze the determinants of crop insurance demand in Telangana and India.

Data and Methodology

The current study utilized both secondary and primary data. Primary data collected through structured questionnaire during December 20017 at Yella reddy Gudem Village of united Nalgonda district, Telangana state. There are 120 families in the village out of which 100families have been surveyed because they exclusively depending upon agriculture production activities. The secondary data gathered from Agriculture Insurance Company of India Limited, Regional Office of Hyderabad, Telangana State. In order to analyze the data study has employed the econometric and simple statistical methods like percentages, standard deviation for quantitative data and Probit Regression for the qualitative data. In Probit Regression I considered how farmers demand for crop insurance is depending up on various factors and how they are significant to determine the farmers crop insurance decisions. The main agriculture crops cultivated in this selected sample area are paddy, cotton, red gram and horticultural crops lemon and sweet lemon juice. Thirteen variables utilized in the Probit Regress in out of which ci purchase= crop insurance purchase is a dependent variable (binary) purchased=1 and =0 otherwise, f community= farmer community, f age= farmer age, experience= farmer experience, family size= family size, f education= farmer education, f loan= farmer loans, f landholding= farmer land holding, percerain= perception on rain, f awareness cip= farmer awareness on crop insurance, low pricag pro=low price of agriculture produce, farm income= farm income, f cost of culti= farm cost of cultivation. The switching regression model with an endogenous criterion function assumes for any observations 'i'(Maddala 1983).

$Y1i = b1i\ Xi + U1i \quad if\ \alpha Z1i + \mu\ i \leq 0$--------(1)

$Y2i = b2i\ Xi + U2i \quad if\ \alpha Z2i + \mu\ i \geq 0$---------(2)

Where X1i, X2i are vectors of exogenous or predetermined variables; b1, b2, α are the corresponding vectors of parameters and Ui is a random variable.

Results and Discussion

Present study is an attempt to through a light on the interrelated issues by providing empirical evidence in three areas using a household survey data collected in December, 2017 from rural village of Telangana State, India. Primary, by describing the level by which rural growers in our sample village have crop insurance policy, we aim to increase our understanding about the relative status of crop insurance in rural economy. Another, by examining rural households' features and the status of crop insurance, I am concerned in measuring the possible fundamental aspects behind family's decision on purchasing or not purchasing crop insurance. Finally, by comparing the State-own agricultural insurance program to other insurance programs, we are able to identify the extent to which insurance has achieved their potential, and the way of developing Telangana State crop insurance. Basically, my research results and suggestions dedicate to giving the retort to the government, AIC Regional officers, bankers and agriculture extension personal to increase the participation the agriculture farmers.

Table 1: Summery statistics of the secondary data

Variable	OBS	Mean	Std. Dev	Min	Max
SN	28	15.5	8.225975	2	29
SESN	0				
NFCOV	28	1069728	862202.1	145400	3050748
AINSU	28	1627970	1318912	239100	4502741
SINSU	28	222076.3	183189.6	19271.78	660582.1
GPIM	28	6314.862	5901.586	394.68	20907.37
PSDY	28	562.0396	505.1544	48.16	1718.74
CLMS	28	16603.96	25148.73	0	80215.47
NFBEN	28	240359	311773.1	0	1153600

Table 1 reveals the summery statistics of the Telangana state (United AP) crop insurance scheme since its implementation of NAIS. The average numbers of farmers covered under the crop insurance scheme is 1069728. The highest farmers covered is 3050748 during the karief season 2009 and minimum was during rabi 2003. The mean area of insured sum insured is 1627970 and 222076 respectively. The average values of pross premium, premium subsidy are 6314, 562 lacks respectively. The average number of farmers claimed the crop insurance and mean of farmers benefited under the scheme are 16603 and 240359 respectively.

Table 2: Summery statistics of the primary data

Variable	OBS	Mean	Std. Dev.	Min	Max
Ci Purchase	100	.24	.4292347	0	1
F Community	100	3.48	.7847022	1	4
F Age	100	49.42	14.33945	10	80
F Experience	100	32.52	18.25879	4	70
Family Size	100	4.44	1.208723	2	9
F Education	100	1.32	1.354976	0	4
F Loan	100	.94	.2386833	0	1
f Landholding	100	2.1	1.660595	1	9
Perce rain	100	1.5	.904534	0	3
F Awareness ~ P	100	.4	.492366	0	1
Low Price group	100	.54	.5009083	0	1
Farm Income	100	282203	234562.6	28800	1206000
F Cost of Cultivation	100	92840.34	88233.8	17	400000

Table 2, explains the summery statistics of all the variables used in Probit model namely mean values, standard deviation, minimum, maximum and number observations.

The crop insurance purchase is a de3pendent variable and remaining are the independent variable.

Table 3: Estimated Coefficients of Profit Model (Probability of Buying Crop Insurance)

Profit regression — Number of OBS = 100

LR chi2(12) = 22.74 — PROB> chi2 = 0.0300

Log likelihood = -43.736487 — Pseudo R2= 0.2063

Ci Purchase	Co-Ef.	Std. ERR.	z	P>|z|	[95% Conf. Interval]
F Community	.164358	.2677832	0.61	0.539*-.3604874	.6892034
F Experience	-.0380761	.018072	-2.11	0.035***-.0734965	-.002655
F Age	.0291795	.0208335	1.40	0.161**-.0116534	.0700124
Family Size	.6414188	.2060632	3.11	0.002*** .2375424	1.045295
F Education	-.0973294	.1289624	-0.75	0.450** -.3500911	.1554323
F Loan	-.2354528	.7120116	-0.33	0.741 -1.63097	1.160064

F Land holding	-.129222	.1086171	-1.19	0.234**-.3421075	.0836635
Perce Rain	-.0645488	.2227212	-0.29	0.772 -.5010743	.3719767
F awareness CIP	-.4107354	.3899874	-1.05	0.292** -1.175097	.3536258
Low Pricagpro	.4688767	.3751879	1.25	0.211**-.2664781	1.204232
Farm Income	-4.74e-07	9.79e-07	-0.48	0.629 -2.39e-06	1.45e-06
F cost of Culti	-5.47e-06	3.31e-06	-1.65	0.098**-.000012	1.01e-06
Cons	-3.33449	1.635008	-2.04	0.041-6.539046	-.1299339

*Significant at 1% level, ** Significant at 5% level, * Significant at 10% level.*

Identifying the imperfect knowledge on the effectiveness of crop insurance markets in Telanga State and India, Probit Model of household survey revealed few exciting findings arisen from this study. Firstly, families' decisions on whether to purchase crop insurance or not are mainly determined by households' farm community, farm experience, farmer age family size, farmer education, farmer land holding, farm cost of cultivation significantly.

III. Conclusions and Suggestions

It is concluded that 35 years of crop insurance history in India is revealing several aspects like still the coverage of the farmers under the crop insurance schemes is low and premium rate are unaffordable to the rural farmers. The awareness on the crop insurance schemes is very low in and around the Telangana state and India. The stakeholders of the scheme ware utterly failure in disseminating the information to the rural illiterate farmers. As a consequence of this low awareness on crop insurance the demand for crop insurance schemes are also not in an expected level of the respective governments. In order to strengthen the crop insurance schemes in India its member states and union territories the government and AIC have to take more responsibility to disseminate the advantages of the schemes to the illiterate farmers by several methods like advertisements and announcements in villages, playing small skits, songs etc will definitely increase the farmers awareness on the schemes and same will lead to an increase in demand for crop insurance.

The bankers and Agricultural extension personal have to be more responsible in the above said direction. It should be the major responsibility of bankers to inform the farmer while he is taking the crop loan from bank why and for what purpose the certain amount (crop insurance premium) is deducted from the loan account has to be properly explained. Agriculture Officers are also have to explain the advantages of crop insurance scheme, crops covered, risks covered, claim procedure of scheme etc to the farmers so that farmers can understand the scheme and motivated to take or purchase the crop insurance scheme.

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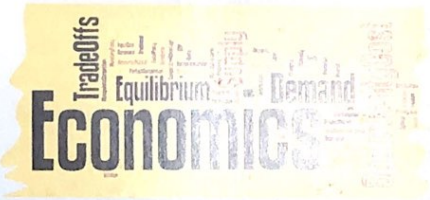

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