



ROLE OF AI IN RISK MANAGEMENT AND CROP INSURANCE OF THE AGRICULTURE SECTOR IN TELANGANA

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ABSTRACT

Indian agriculture has, since Independence, made rapid strides in taking the annual food grains production from 51 million tonnes in the early fifties to 206 million tonnes at the turn of the century; it has contributed significantly in achieving self-sufficiency in food and in avoiding food shortages. Over 200 million Indian farmers and farm workers have been the backbone of India's agriculture. Despite having achieved national food security, the well-being of the farming community continues to be a matter of grave concern for planners and policymakers. Under this backdrop, the Government of India prepared the National Agricultural Policy document in 2000.

Risk management and Crop Insurance play an important role in farm activities to fulfill the vision of the Government to develop agriculture and rural development. As with all forms of lending, however, agricultural credit and insurance present the bankers in India with a unique set of risks. Each agroclimatic region of the country has unique conditions that are reflected in the variety of crops produced and marketed.

In recent days of agriculture, Artificial Intelligence-enabled solutions are helping insurers to manage risk, accelerate efficiencies, and improve profitability. Several catalysts are fueling the adoption of this technology in the insurance sector.

Introduction:

Agriculture is the main occupation of the state's economy. Agriculture and allied sectors formed the backbone of Telangana's economy, playing a crucial role in both employment and livelihood. 66.15% of the rural workforce in Telangana is engaged in agriculture and allied sectors. 47.34% of the overall workforce in the state is employed in these sectors. The agriculture sector's contribution to Telangana's **Gross State Value Added (GSVA)** has remained consistent, hovering around 16-17%. There has been a consistent increase in crop production due to several innovative strategies coupled with favourable weather conditions. However, agriculture is one of the most risky and difficult professions, yet inevitable for the living of a large multitude of people in rural areas. Circumstances have compelled 2/3 of our fellow citizens to make their livelihood from the sector. Unfortunately, 83% of them have less than one or two hectares of land to support the entire family. The marginal income they earn is also uncertain due to climatic aberrations, pest insurance, marketing difficulties, etc. AI plays a vital role in agricultural risk management by providing predictive analytics for better crop planning and pest or disease detection, and by enabling efficient insurance processes like automated claims and dynamic risk pricing. Technologies such as satellite imagery and machine learning help insurers assess risks, determine premiums more accurately, and expedite payouts, creating a more resilient and data-driven system for both farmers and insurers.

Objectives of the study:

1. To study the risks attacking agriculture due to natural disasters and market fluctuations etc.
2. To examine risk management methods in Indian agriculture.
3. To know the need and importance of Crop Insurance in agricultural development.
4. To analyse the different agriculture insurance schemes introduced in the state of Telangana.
5. To know the role of AI in supporting farmers to manage the risk in the cultivation and to

ensure agricultural profitability.

Methodology:

The methodology used in this paper with the use of data from secondary sources.

Hypothesis:

Artificial Intelligence is playing an important role in managing risk, accelerating efficiencies, and improving the profitability of agriculture, which is necessary to protect the farmers and ensure their credit eligibility for the next season.

Risks associated with Agriculture and the assistance of Artificial Intelligence

With the diversification of agriculture and higher exposure in this sector, the insurance and risk management activities have become more important.

Apart from a unique set of risk elements, all three major risk components are playing an important role in making lending to agriculture and agro-based activities more risky in comparison to other sectors.

A. Credit Risk: Credit risk associated with agricultural lending. A farmer's production and ability to service debt can be seriously affected by the natural factors not directly under the farmer's control. It may affect directly or indirectly both borrowers' repayment capacity and the value of the product.

- AI, combined with satellite imagery, provides real-time data on crop health and field conditions, allowing insurers to monitor potential risks dynamically and respond quickly to developing issues.

B. Market and Price Risk: One of the major problems faced by farmers is the fluctuations in prices. Often, when the crop is good, they get low prices and thus are not able to get the full benefit of the good production during the year.

- AI-driven systems can automatically trigger payouts when predefined risk thresholds, such as specific temperature drops or rainfall levels, are met, speeding up financial relief for farmers.

C. Operational Risk: Risks and uncertainty are pervasive in agricultural operations and are perceived to be more serious than in most non-farm activities. The type of severity of risks which farmers face varies with the type of farming system, the physical and economic conditions, the prevailing policies, etc.

1. Production and yield risk:- Agricultural risk has been synonymous with production risk. Yield uncertainty due to natural hazards refers to the unpredictable impact of weather, pests and diseases, and calamities on farm production.

- AI algorithms analyze historical weather patterns, market data, and crop yields to forecast potential risks like droughts, floods, or pest outbreaks, allowing farmers to plan proactive measures.
- AI-powered image recognition, often through mobile apps and drones, can identify early signs of pest infestations and diseases in crops, enabling timely interventions to reduce losses.
- AI systems monitor real-time conditions to automate irrigation and optimize the use of water, fertilizers, and pesticides, reducing waste and improving overall efficiency.

2. Weather risk:- The vagaries of weather conditions cause uncertainty in production. Some of the current responses to adverse weather conditions, including changes in cropping patterns, are reduced input usage and low technology adoption.

- AI algorithms analyze historical weather patterns, market data, and crop yields to forecast potential risks like droughts, floods, or pest outbreaks, allowing farmers to plan proactive measures.

The state Government manages several Insurance and Risk Management Programs with the help of Artificial Intelligence.

Risk Management and Agriculture Insurance-State Government Programs introduced in the combined State (Before 2014)

Jala Yagnam: Under this scheme, the Government proposed to complete the construction of irrigation projects that were pending for quite a long time. So far, 12 projects have been completed, and 13 projects are under the final stages of completion.

Polambadi: This program is full of innovations like Integrated Nutrient Management(INM), Integrated Water Management, etc. These programmes were taken up in more than 35800 polambadis during 2004-05 to 2008-09, involving an expenditure of Rs. 50.54 crores. The impact of Polambadi is encouraging, in which several benefits were accomplished, such as,

1. 5.86 lakh farmers were trained in Polambadi.
2. Cost of cultivation was reduced, and net benefits of Polambadi over farmer practice fields were increased.

Seeds Subsidy: The seed distribution on subsidy has been given due attention. During 2003-04, seven lakhs quintals of seeds were distributed with a subsidy of Rs. 148.85 crores. It was increased to 16.49 lakh quintals with a subsidy of Rs. 270.88 crores during 2008-09. It is planned to supply around 50 lakh quintals for the coming years with the subsidy of Rs. 450 crores.

Fertilizer Subsidy: After the Green Revolution, the focus was largely on the application of chemical fertilizers, which has caused severe degradation in soil productivity. From the year 2004-05, thrust was given to INM by introducing organic manure in a big way. Therefore, Vermicompost development was introduced during 2004-05, which gradually increased every year. It is planned to supply 1450 vermicompost big units and 2956 vermicompost small units during 2009-10.

Farm Mechanization: Farm Mechanization was given a boost by supplying implements for land preparation, sowing, plant protection, harvest, and post-harvest needs. An amount of Rs. 253.38 lakhs was spent as subsidy, which was further increased to Rs. 1664.50 lakhs in 2003-04 and Rs. 10720.26 lakhs in 2008-09. Rs. 7,945 lakhs was the financial achievement during 2010-11.

Crop Insurance: National Agriculture Insurance Scheme, introduced in 1999-2000, is a new scheme titled "National Insurance Agriculture Scheme" (NAIS) or "Rashtriya Krishi Bima Yojana" in the State. The scheme NAIS envisages coverage of all food crops, oilseeds, horticultural, and commercial crops. It covers all farmers, both loanees and non-loanees, under the scheme. Small and marginal farmers are entitled to a subsidy of 50% of the premium charged the subsidy is shared equally between the State and Central Governments.

20 types of crops covered under NAIS. Crop Insurance is compulsory for all loanee farmers and voluntary for non-loanee farmers. A 10% subsidy is allowed on the premium to small and marginal farmers.

Village as Insurance Unit: For providing more benefits to the farming community, particularly for small and marginal farmers, the combined Andhra Pradesh State Government started Village as Insurance Unit on a pilot basis during kharif 2005 and continued during kharif 2006 in 5 districts. During 2008, this programme was extended to all districts of the state.

Programs introduced in the State (After 2014)

Rythu Bharosa(Rythu Bandhu):-The Government of Telangana launched the Rythu Bharosa Scheme to provide comprehensive support to the agricultural community, ensuring farmers receive timely credit to meet their farm activities. It is decided to provide investment support of Rs 12,000 per acre to farmers annually under Rythu Bharosa, against Rs 15,000 promised by the party during the 2023 Assembly elections.

Rythu Bheema:-Rythu Bima is a life insurance scheme by the Telangana government for farmers, providing a financial payout of ₹5,00,000 to the nominee of an eligible farmer in case of natural or accidental death. The scheme offers insurance coverage and aims to provide financial security to the bereaved farmer's family, with claims settled quickly through direct bank transfers.

Loan Waiver Scheme:-Under this scheme, loans up to ₹2 lakh (including principal and interest) per farmer family will be waived. Farmers' eligibility is determined by food security cards issued by the Civil Supplies Department. The waiver applies to short-term loans obtained between 12th December 2018 and 9th December 2023 from Scheduled Banks, Rural Banks, and District Cooperative Banks.

Crop Insurance and Artificial Intelligence

The integration of AI helps build a more data-driven and efficient agricultural insurance system, enhancing agricultural resilience and contributing to food security by mitigating the impacts of climate variability. It helps insurers set fair premiums, offers farmers personalized recommendations, and promotes transparency by analyzing vast datasets on weather, soil, and crop performance. AI also supports parametric insurance solutions, which use triggers like rainfall or temperature to automate payouts and contribute to broader agricultural resilience against climate change.

- AI models analyze historical weather, market trends, and crop patterns to forecast yields and potential risks.
- This data helps insurers accurately assess risks, set appropriate premiums, and potentially identify fraudulent claims.
- AI integrates with local data to trigger payouts based on real-world climate events, such as excessive rainfall or drought.
- This approach offers a transparent and scalable way to deliver insurance benefits, often with automated claim settlements via smart contracts.
- Digital validation of claims using AI and satellite data helps to minimize fraudulent claims and build trust.

- Parametric insurance and blockchain technology offer greater clarity and verifiable data for both farmers and insurers.
- By providing better risk management tools and timely payouts, AI helps farmers adapt to climate variability and fosters agricultural resilience.

Conclusion;

The Central and State Governments have been making great plans for agriculture and rural development, and these plans have done a lot for poverty alleviation in rural India. However, as is visible from the mass suicides in different parts of the state, a lot more needs to be done, and that will be possible with greater selfless dedication and extensive devolution of powers to the Gram Panchayats, and with transparency in fund allocation and utilization

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