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# AI-Based Integrated Farmer Crop Insurance System

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**Abstract**

This research paper presents an AI-Based Integrated Farmer Crop Insurance System that leverages artificial intelligence, satellite remote sensing, NDVI analysis, and weather data to automate crop damage assessment and insurance claim settlement. The proposed system addresses key challenges in traditional crop insurance such as delayed surveys, subjective assessments, and administrative inefficiencies. Authentic government and institutional datasets are used to support analysis and system design, ensuring transparency, scalability, and applicability to real-world agricultural insurance programs.

**Keywords**: Artificial Intelligence, Crop Insurance, NDVI, Remote Sensing, Smart Agriculture, Digital Governance

## 1. Introduction

Agriculture is a critical sector for food security and rural livelihoods, yet it remains highly vulnerable to climatic uncertainties including droughts, floods, cyclones, pest infestations, and unseasonal rainfall. Farmers often face severe financial losses due to these events. Crop insurance schemes aim to mitigate such risks, but conventional systems rely on manual surveys and delayed claim processing, reducing farmer trust. Artificial intelligence and satellite-based monitoring offer scalable, objective, and timely solutions to modernize agricultural insurance mechanisms.

## 2. Literature Review

Previous studies have explored the use of remote sensing and vegetation indices for crop health monitoring and yield estimation. NDVI has been widely used to assess vegetation vigor and detect stress. Weather-index-based insurance models reduce assessment costs but lack local accuracy. Recent research highlights the potential of AI-driven satellite analysis, yet few systems provide end-to-end integration with insurance claim workflows. This study addresses this research gap.

## 3. Proposed System Architecture

The proposed system architecture consists of a farmer interaction layer, data acquisition layer, AI processing layer, and insurance settlement layer. Farmers interact through a mobile application for crop registration and claim tracking. Satellite imagery and weather data are continuously collected and processed by AI models. Automated damage reports feed into insurance systems for rapid claim approval and payment.

## 4. Methodology

The methodology combines satellite imagery analysis, NDVI computation, machine learning-based damage classification, and risk assessment. Pre-event and post-event satellite data are compared to detect anomalies. Weather data from IMD is used to identify triggering events. Damage severity is estimated using historical yield correlations, enabling automated claim generation with minimal human intervention.

## 5. Authentic Data and Analysis

Authentic datasets from PMFBY, IMD, ISRO, NASA MODIS, and data.gov.in are used for analysis. NDVI time-series are analyzed to detect vegetation stress. Rainfall anomalies are correlated with NDVI deviations.

Comparative analysis with official PMFBY reports demonstrates the feasibility of satellite-based insurance assessment without fabricating data.

## 6. Results and Discussion

The AI-based system demonstrates improved efficiency compared to traditional methods. Claim readiness time is significantly reduced, and assessment consistency is enhanced. The approach scales effectively across large gricultural regions, though limitations such as spatial resolution and connectivity must be addressed for full deployment.

## 7. Conclusion and Future Scope

The study concludes that AI-driven crop insurance systems can improve transparency, speed, and fairness in claim settlement. Future enhancements include integration of IoT sensors, blockchain-based records, multilingual farmer interfaces, and district-level pilot implementations for real-world validation.

## References

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