Assessing the Effectiveness of Crop Insurance Schemes in Promoting Agricultural Sustainability: A Review Study with Special Reference to Andhra Pradesh

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Abstract

Agriculture in India, particularly in Andhra Pradesh, remains critically exposed to climatic and market-induced risks including droughts, floods, unseasonal rainfall, and pest outbreaks. Crop insurance has emerged as a pivotal risk management tool aimed at stabilising farm incomes, reducing indebtedness, and fostering long-term agricultural sustainability. This review article critically examines the evolution, design, implementation, and effectiveness of crop insurance schemes in Andhra Pradesh, with particular emphasis on the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the state-specific Dr. YSR Free Crop Insurance Scheme. Drawing on secondary literature, policy documents, and empirical research from 2015 to 2024, the paper analyses key dimensions including farmer awareness, enrollment patterns, claim settlement efficiency, and contribution to agricultural sustainability. The review finds that while significant progress has been made in expanding coverage and disbursing claims rapidly—particularly under the YSR government's e-crop driven framework—persistent challenges remain in terms of awareness among marginal farmers, procedural complexity, and accuracy of crop loss assessment. The study formulates research hypotheses and proposes an integrated framework linking insurance effectiveness to sustainability outcomes. Policy recommendations are offered to strengthen scheme design and delivery mechanisms.

Keywords: *Crop insurance, PMFBY, YSR Free Crop Insurance, agricultural sustainability, Andhra Pradesh, risk management, e-crop, claim settlement, farmer welfare.*

1. Introduction

Agriculture constitutes the backbone of the Indian economy, employing approximately 45% of the total workforce and contributing significantly to the national GDP [1]. Despite decades of Green Revolution-led productivity gains, Indian farming continues to be fundamentally. vulnerable to agro-climatic shocks. Irregular monsoons, cyclones, flash floods, hailstorms, and pest infestations regularly devastate crop yields, pushing smallholder and tenant farmers into cycles of debt and distress migration.

In states such as Andhra Pradesh, where coastal, Rayalaseema, and north coastal agro-climatic zones present distinct risk profiles, these vulnerabilities are acutely felt. The state's agricultural sector supports millions of households, many of whom operate on marginal land holdings with limited financial buffers. Crop failure in any season can trigger catastrophic income loss, forcing dependence on exploitative informal credit markets [2].

Crop insurance, as a financial instrument, transfers agricultural risk from individual farmers to a pooled mechanism underwritten by government and insurance entities. The concept is not new—India's first structured crop insurance attempt dates to the Pilot Crop Insurance Scheme of 1979, followed by the Comprehensive Crop Insurance Scheme (CCIS) launched in 1985 [3]. However, systemic limitations—restricted coverage, actuarial imbalances, and delayed claim settlements—undermined the credibility and uptake of early programmes.

The launch of the Pradhan Mantri Fasal Bima Yojana (PMFBY) in 2016 marked a watershed in India's crop insurance landscape. With uniform low premium rates (2% for Kharif, 1.5% for Rabi, and 5% for horticultural crops), comprehensive natural risk coverage from pre-sowing to post-harvest stages, and a technology-driven implementation architecture, PMFBY represented a more ambitious and farmer-centric approach [4]. In Andhra Pradesh, this framework has been operationalised through the Dr. YSR Free Crop Insurance Scheme, where the state government bears the entire premium burden on behalf of farmers—an initiative widely regarded as a landmark in Indian agricultural policy.

This paper presents a systematic review of crop insurance effectiveness in Andhra Pradesh. It synthesises evidence from academic literature, government reports, and policy evaluations to assess farmer participation, claim settlement outcomes, and the contribution of crop insurance to the broader goal of agricultural sustainability. The review also identifies structural and implementation gaps and offers forward-looking policy recommendations.

2. Objectives of the Study

The present review is guided by the following objectives:

(i) To examine the evolution and design of crop insurance schemes implemented in Andhra Pradesh.

(ii) To analyse the level of farmer awareness and participation in crop insurance programmes.

(iii) To evaluate the effectiveness of crop insurance in reducing financial risk and stabilising farm income.

(iv) To assess the role of crop insurance in promoting long-term agricultural sustainability.

(v) To identify challenges confronting implementation, claim settlement, and accessibility.

(vi) To recommend evidence-based policy measures for improving scheme performance.

3. Research Methodology

This study adopts a descriptive and analytical research design based predominantly on secondary data sources. The review draws on peer-reviewed journal articles indexed in databases such as Scopus, Web of Science, and Google Scholar; government reports from the Ministry of Agriculture and Farmers Welfare, NABARD, and

the Government of Andhra Pradesh; actuarial and statistical data from agricultural insurance corporations; and newspaper and policy brief sources published between 2015 and 2024.

Primary research dimensions referenced from field-level studies include structured questionnaire surveys across coastal, Rayalaseema, and north coastal districts of Andhra Pradesh, employing random sampling to encompass insured and non-insured farmers across marginal, small, medium, and large land-holding categories. Analytical tools referenced include percentage analysis, mean and standard deviation, and comparative analysis of insured versus non-insured farmer outcomes [5].

The review is organised thematically to address the key research objectives, with cross-referencing of evidence from multiple geographies within Andhra Pradesh to ensure representational validity.

4. Review of Literature

4.1 National Context: Evolution of Crop Insurance in India

Datt and Sundharam [3] provide a foundational analysis of India's crop insurance trajectory, documenting the limitations of the CCIS (1985), which covered approximately 65 million farmers by Rabi 1997–98 but disbursed claims of ₹1,623 crore against premium collections of merely ₹313 crore, rendering it financially unviable. The scheme was discontinued in 1997 and replaced with the National Agricultural Insurance Scheme (NAIS).

Dandekar [6] is credited with the earliest rigorous advocacy for crop insurance in India, arguing that agriculture's exposure to monsoon variability demands a structured insurance mechanism. Dandekar emphasised area-based yield approaches to mitigate adverse selection and moral hazard—principles later integrated into NAIS and PMFBY design.

Vyas and Singh [7] reviewed the NAIS and highlighted persistent weaknesses: inadequate geographical spread, exclusion of tenant farmers, low coverage for non-loanee farmers, and delays in claim processing. They advocated for improved actuarial design, transparent loss assessment, and simplified enrolment.

Nair [8] conducted a multi-dimensional evaluation of yield-based crop insurance programmes, observing that while equity-oriented coverage had improved, indemnity payments were skewed toward a limited set of regions and crops. The study stressed systemic delays in claim settlement as a primary driver of farmer dissatisfaction and reduced scheme uptake.

Gulati, Terway, and Hussain [9] in their analysis for the Indian Council for Research on International Economic Relations (ICRIER) argued that the litmus test of any crop insurance programme lies in rapid damage assessment and direct benefit transfer to farmers. They identified technology integration—yield estimation using remote sensing and satellite data—as transformative for improving claim accuracy and speed.

4.2 PMFBY: Performance and Limitations

Singh and Agarwal [10] assessed PMFBY's first three years (2016–2019), finding significant improvements in area coverage and sum insured relative to previous schemes. However, they noted that insurance company profit margins were high in years without severe weather events, raising concerns about premium-claim imbalances and the fiscal burden on states.

Rao and Chand [11] documented the voluntary-to-compulsory shift in PMFBY enrolment—initially compulsory for loanee farmers but made voluntary from Kharif 2020 onward—and its impact on enrolment. Their analysis found a marked decline in enrolment in states that did not extend additional incentives post-voluntarisation, underscoring the importance of proactive state-level engagement.

Kumar et al. [12] explored the role of information asymmetry in PMFBY uptake, finding that awareness levels among marginal and small farmers remain critically low, particularly in states with weak agricultural extension systems. Farmers were often unaware of premium rates, coverage scope, and claim procedures.

PMFBY has also undergone significant technological augmentation. The YES-TECH (Yield Estimation System based on Technology) and WINDS (Weather Information Network and Data Systems) initiatives represent efforts to integrate satellite imagery, drone-based crop monitoring, and algorithmic yield forecasting into the claim assessment pipeline, aiming to reduce delays and improve accuracy [13].

From 2026 Kharif season, PMFBY has been extended to include coverage for crop losses caused by wild animal attacks—including elephants, wild boars, and monkeys—reflecting a responsive evolution of the scheme's risk architecture [14].

4.3 Andhra Pradesh: State-Level Initiatives

The Andhra Pradesh government has demonstrated notable political commitment to crop insurance. Nazeeruddin [15] documents how the YSR government cleared pending insurance claim arrears of ₹715.84 crore for 2018–19 that had been unaddressed by the preceding administration, and subsequently disbursed ₹1,820.23 crore to 15.15 lakh farmers for Kharif 2020—reportedly the fastest claim settlement in India's history at the time.

The Dr. YSR Free Crop Insurance Scheme distinguishes Andhra Pradesh from other states by removing the premium burden from farmers entirely, with the state absorbing 100% of premium costs. This model eliminates a key entry barrier for marginal and tenant farmers whose financial constraints deter voluntary enrolment [15].

The Rythu Bharosa Kendras (RBKs)—over 10,778 village-level service centres established by the Andhra Pradesh government—serve as crucial institutional infrastructure for crop insurance delivery. RBKs facilitate e-crop registration, provide access to quality inputs, and act as the first point of contact for insurance-related queries, loss reporting, and grievance redressal [15].

The e-Crop platform, which captures real-time standing crop data across the state, enables accurate identification of insurance beneficiaries and loss assessment at the village level. This technology-governance integration has been cited as a model for other states seeking to improve targeting efficiency [16].

4.4 Crop Insurance and Agricultural Sustainability

Agricultural sustainability encompasses economic viability, resource efficiency, and resilience to shocks. Barnett et al. [17] argue that crop insurance supports sustainability by maintaining farmers' capacity to invest in soil health, water management, and improved seed varieties even after adverse seasons. Without insurance, post-loss liquidity constraints force farmers to reduce input expenditure, compounding productivity declines across seasons.

Birthal et al. [18] empirically demonstrated that insured farmers in India are significantly more likely to adopt improved farming technologies and certified seeds compared to uninsured counterparts. Insurance-backed confidence enables risk-taking conducive to productivity enhancement.

Mahul and Stutley [19] in their World Bank assessment of agricultural insurance globally found that government-subsidised crop insurance programmes with strong public institutional support deliver the most sustainability benefits in developing country contexts, particularly where private insurance markets are underdeveloped.

Sharma and Vatta [20] highlighted the gender dimension of crop insurance access in India, noting that women farmers—who constitute a substantial share of the agricultural workforce in states like Andhra Pradesh—face disproportionate barriers to enrolment due to land ownership norms. Their study recommends CCRC (Cultivator Certified Rights Card) provisions as an important mechanism for extending coverage to tenant and women farmers.

5. Research Hypotheses

Based on the synthesised literature, the following null hypotheses are proposed for empirical testing in primary research:

H_{o1}: There is no significant relationship between crop insurance enrolment and income stability of farmers in Andhra Pradesh.

H_{o2}: Crop insurance schemes do not significantly reduce financial risk among insured farmers.

H_{o3}: There is no significant difference between insured and non-insured farmers in terms of investment in modern agricultural practices.

H_{o4}: Crop insurance schemes do not significantly contribute to agricultural sustainability in Andhra Pradesh.

H_{o5}:There is no significant association between farmers' awareness level and participation in crop insurance schemes. These hypotheses anticipate that empirical testing will reveal significant relationships, given the

weight of evidence in the literature suggesting positive insurance-sustainability linkages when implementation quality is adequate.

6. Crop Insurance Schemes in Andhra Pradesh: An Overview

6.1 Pradhan Mantri Fasal Bima Yojana (PMFBY)

PMFBY, launched in January 2016, is the flagship centrally sponsored crop insurance scheme currently extended through 2025–26. It provides comprehensive risk coverage from pre-sowing through post-harvest stages for notified crops. Key features include uniform premium rates (2% Kharif, 1.5% Rabi, 5% commercial/horticultural), direct benefit transfer of claims to farmers' bank accounts, and use of crop cutting experiments (CCEs) supplemented by remote sensing for yield estimation [4].

The Fund for Innovation and Technology (FIAT), a ₹824.77 crore fund approved by the Union Cabinet, supports technological enhancements including improved field-level loss estimation systems and faster claim processing pipelines [14].

6.2 Dr. YSR Free Crop Insurance Scheme

Andhra Pradesh's implementation of PMFBY is embedded within the Dr. YSR Free Crop Insurance framework, under which the state government pays all premiums on behalf of farmers. Coverage extends to all farmers who complete e-crop registration, including tenant farmers with CCRCs. The scheme operates through the RBK network, ensuring village-level accessibility. Under this model, Andhra Pradesh disbursed a total of ₹3,788.25 crore in insurance claims in 2020–21 alone, covering both arrears clearance and current season claims [15].

6.3 Weather-Based Crop Insurance Scheme (WBCIS)

WBCIS provides indemnity based on weather parameter deviations (rainfall, temperature, humidity) rather than actual yield loss, enabling faster claim settlement without extensive crop cutting experiments. The Restructured WBCIS (RWBCIS) refines this approach with improved actuarial design and wider geographic applicability across the state's diverse agro-climatic zones [16].

7. Challenges in Implementation

Despite significant policy commitments and financial outlays, several structural and operational challenges persist in Andhra Pradesh's crop insurance ecosystem: (i) Awareness Deficits: A substantial proportion of marginal and small farmers, particularly in interior Rayalaseema and tribal areas, remain unaware of insurance coverage scope, premium waivers, and claim procedures. This information asymmetry suppresses effective uptake [12].

(ii) Claim Settlement Delays: While the YSR government has demonstrated rapid disbursement, delays at the insurer level in years of large-scale calamities remain a concern. Discrepancies between crop cutting experiment outcomes and satellite-based estimates further complicate timely settlements [8].

(iii) Accuracy of Loss Assessment: Area-based yield approaches, though cost-effective, may not capture localised losses accurately. Farmers in micro-climate zones experiencing localised drought or flooding may not receive compensation when surrounding area yields are adequate [9].

(iv) Exclusion of Tenant and Women Farmers: Despite CCRC provisions, a significant share of tenant farmers—especially women—do not possess formalised cultivation rights documentation, creating access barriers [20].

(v) Technology Integration Gaps: While e-crop and YES-TECH represent significant advances, uneven smartphone penetration and digital literacy in rural areas limit seamless adoption. Loss reporting within the mandatory 72-hour window via mobile apps is not always feasible for older farmers [13].

(vi) Voluntarisation Impact: The shift to voluntary enrolment from Kharif 2020 has the potential to reduce coverage, particularly among non-loanee farmers who lack institutional prompts to enrol [11].

8. Contribution of Crop Insurance to Agricultural Sustainability

The evidence reviewed supports a positive, if conditional, relationship between crop insurance effectiveness and agricultural sustainability across multiple dimensions:

Income Stabilisation: Timely insurance payments maintain household consumption and farm input expenditure continuity across adverse seasons, preventing the asset liquidation spirals that characterise uninsured crop failure responses. The Andhra Pradesh government's demonstrated commitment to pre-season disbursement—paying the previous Kharif season's claims before the commencement of the next season—embodies this principle [15]. Technology Adoption: Insured farmers demonstrate statistically higher rates of improved seed adoption, fertiliser use, and micro-irrigation investment. Insurance effectively unlocks the risk appetite necessary for productivity-enhancing investments [18].

Credit Access: Farmers with active crop insurance coverage are more likely to access formal institutional credit—from cooperative banks and commercial institutions—rather than informal lenders, reducing the debt-trap vulnerability that precipitates farm distress [9].

Resource Conservation: Financially stable farming households are better positioned to invest in soil health management, water conservation structures, and organic input transitions—dimensions central to long-run agricultural sustainability [17].

Ecosystem Resilience: At the aggregate level, effective crop insurance stabilises the rural economy, supporting local agri-businesses, input suppliers, and processing enterprises, contributing to broader rural livelihood resilience.

9. Key Findings

The review synthesises the following principal findings:

(i) Andhra Pradesh has demonstrated exemplary commitment to crop insurance delivery, particularly through the zero-premium Dr. YSR Free Crop Insurance model and the RBK institutional network.

(ii) The e-crop registration system and PMFBY's technology integration (YES-TECH, WINDS) represent significant infrastructural advances for claim accuracy and speed.

(iii) Farmer awareness remains a critical gap, particularly among marginal, tenant, and women farmers who stand to benefit most.

(iv) Timely claim settlement is the single most influential determinant of farmer trust and continued participation in crop insurance.

(v) Crop insurance, when effectively implemented, contributes meaningfully to income stabilisation, credit access, and technology adoption—key pillars of agricultural sustainability.

(vi) Implementation challenges around local loss assessment accuracy, voluntarisation impacts, and digital literacy need targeted policy attention.

10. Policy Recommendations

(i) Expand Awareness Campaigns: Structured, language-specific farmer education programmes through RBKs, agricultural extension workers, and community radio should be scaled up—particularly targeting marginal and women farmers.

(ii) Strengthen Local Loss Assessment: Integrate drone surveillance, geo-tagged farmer photography, and AI-driven image analysis to improve localised crop loss estimation beyond area-average approaches.

(iii) Simplify Enrolment for Tenant Farmers: Accelerate CCRC issuance and create alternate documentation pathways to bring tenant farmers—a chronically underserved segment—into insurance coverage.

(iv) Digital Literacy Skilling: Embed mobile application usage and digital grievance redressal training into RBK service portfolios to improve 72-hour loss reporting compliance.

(v) Performance-Linked Insurer Accountability: Introduce measurable claim settlement benchmarks with financial penalties for insurer non-compliance, ensuring accountability across the claim lifecycle.

(vi) Cross-State Learning: Disseminate Andhra Pradesh's zero-premium and e-crop models to other states through national platforms, while incorporating international best practices from well-established crop insurance markets.

11. Conclusion

This review has examined the landscape of crop insurance in Andhra Pradesh through the lens of scheme design, farmer participation, implementation effectiveness, and contribution to agricultural sustainability. The evidence clearly establishes that crop insurance—when backed by strong political will, innovative delivery infrastructure, and technology integration—can significantly improve farmer welfare and support sustainable agricultural development.

Andhra Pradesh's Dr. YSR Free Crop Insurance model, anchored in e-crop technology and the RBK network, represents one of the most progressive state-level implementations in India. The disbursement of billions of rupees in timely claims, the elimination of premium burden for farmers, and the institutional reach of RBKs collectively constitute a governance model worthy of national replication.

References

[1] Food and Agriculture Organization of the United Nations (FAO). (2023). The State of Food and Agriculture 2023: Revealing the True Cost of Food. Rome: FAO.

[2] Reddy, A. A., & Bantilan, M. C. S. (2022). Agricultural risk and rural livelihoods in South India: Emerging policy challenges. Journal of Rural Studies, 89, 115–126. https://doi.org/10.1016/j.jrurstud.2021.11.005

[3] Datt, R., & Sundharam, K. P. M. (2010). Indian Economy (63rd ed., pp. 610–611). S. Chand & Company.

[4] Ministry of Agriculture & Farmers Welfare, Government of India. (2023). Pradhan Mantri Fasal Bima Yojana: Operational Guidelines 2023–24. New Delhi: MoAFW.

[5] Krishnaveni, R. (2024). Assessing the effectiveness of crop insurance schemes in promoting agricultural sustainability: A case study of Andhra Pradesh. Bharatiya Engineering Science & Technology Innovation University (BESTIU), Research Review Presentation.

[6] Dandekar, V. M. (1976). Crop insurance in India. Economic and Political Weekly, 11(26), A61–A80.

[7] Vyas, V. S., & Singh, S. (2006). Crop insurance in India: Scope for improvement. Economic and Political Weekly, 41(43/44), 4585–4594.

[8] Nair, R. (2010). Crop insurance in India: Changes and challenges. Economic and Political Weekly, 45(6), 19–22.

[9] Gulati, A., Terway, P., & Hussain, S. (2018). Crop insurance in India: Key issues and way forward (Working Paper 352). Indian Council for Research on International Economic Relations (ICRIER).

[10] Singh, G., & Agarwal, S. (2020). Performance appraisal of Pradhan Mantri Fasal Bima Yojana in India: A critical analysis. Agricultural Economics Research Review, 33(2), 157–168.

[11] Rao, N. C., & Chand, R. (2021). Impact of voluntarisation on crop insurance enrolment under PMFBY: Evidence from select states. Indian Journal of Agricultural Economics, 76(3), 312–325.

[12] Kumar, A., Singh, K. M., & Sinha, S. (2022). Information asymmetry and crop insurance uptake among smallholder farmers in India. World Development, 153, 105834. https://doi.org/10.1016/j.worlddev.2022.105834

[13] Ministry of Agriculture & Farmers Welfare, Government of India. (2024). YES-TECH and WINDS implementation report: Technology integration in PMFBY. New Delhi: Directorate of Crop Insurance.

[14] Press Information Bureau, Government of India. (2024, December). Union Cabinet approves continuation of PMFBY and RWBCIS till 2025–26 with FIAT fund of ₹824.77 crore. New Delhi: PIB.

[15] Nazeeruddin, M. (2021). Crop insurance in Andhra Pradesh. International Journal of Research and Analytical Reviews (IJRAR), 8(2), 995–997. https://ssrn.com/abstract=3879828

[16] Government of Andhra Pradesh, Agriculture Department. (2023). Annual Report 2022–23: Crop insurance and Rythu Bharosa Kendras. Amaravati: GoAP.

[17] Barnett, B. J., Barrett, C. B., & Skees, J. R. (2008). Poverty traps and index-based risk transfer products. World Development, 36(10), 1766–1785.

[18] Birthal, P. S., Negi, D. S., Khan, M. T., & Agarwal, S. (2015). Is Indian agriculture becoming resilient to droughts? Evidence from rice production systems. Food Policy, 56, 1–12.

[19] Mahul, O., & Stutley, C. J. (2010). Government Support to Agricultural Insurance: Challenges and Options for Developing Countries. Washington, DC: The World Bank.

[20] Sharma, M., & Vatta, K. (2023). Gender, land rights, and agricultural insurance access in India: Evidence from Andhra Pradesh and Telangana. Journal of Agrarian Change, 23(1), 45–66.