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Effectiveness of Agricultural Insurance Schemes in Andhra Pradesh: Challenges and Opportunities

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Abstract

India's long history of agriculture has fuelled the growth of crop insurance, from unofficial risk-sharing systems to formalized, sophisticated insurance plans intended to protect farmers against monetary losses brought on by non-specific exposures like diseases, insects, and natural disasters. The Weather Based Crop Insurance Scheme (WBCIS) and the Pradhan Mantri Fasal Bima Yojana (PMFBY), two flagship programs, lessen the effects of these hazards by offering financial protection, enhancing the sustainability and resilience of agricultural livelihoods. Despite the remarkable advancements, crop insurance policies in India still face a number of issues, such as low farmer awareness, a lack of streamlined dispute resolution procedures, and a poor sense of risk. Furthermore, the challenges brought about by the historic shifts and the private sector's involvement have sparked debate regarding the degree of openness and involvement among the participants, which has been made worse by the Covid-19 pandemic. Increased communication, legislative changes, and technological integration have been recognized as critical components for the development and improvement of these schemes. This paper deals with Evaluation of the Insurance Schemes in India and Andhra Pradesh and the Impact of Crop Insurance Schemes on Reducing Farmer Distress and Promoting agricultural sustainability.

Keywords : *Crop Insurance; Agriculture Livelihood; farmer distress; Agriculture Sustainability.*

1. Introduction

Due to pricing volatility and crop output uncertainty, agriculture is a very risky business. Agricultural output is dependent on a number of climatic factors, including temperature, humidity, rainfall, and sunshine. Changes in these weather indicators can have a negative impact on crop yield since they deviate from the amount required for the plant at different stages of growth. It is commonly recognized that weather-induced natural disasters including hurricanes, cyclones, hailstorms, floods, and drought have devastated the agrarian economy. In addition to weather risk, unanticipated events such as pest attacks and plant disease infection frequently result in significant crop losses. However, because input and output prices fluctuate so much, agriculture carries a significant market risk. For starters, the bulkiness and perishability of the products make storage challenging, which makes agricultural prices more erratic. Another is that the demand for agricultural products is not very sensitive to changes in income and price. Consequently, supply shocks show up as significant price fluctuations. However, weather is usually the most important risk factor influencing crop productivity((Miranda and Vedenov, 2001).To lower risk and increase agricultural resilience, the Indian government has implemented a number of initiatives. These include encouraging cropping pattern diversification, intercropping, flood management, drought proofing, and watershed improvement to lower production risk, as well as providing price support through futures trading and market intervention to stabilize prices and mitigate risks. Nevertheless, insurance is thought to be the most efficient way to reimburse farmers for

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their losses in the event of crop failure, whatever the precautions taken. An ex-ante risk adaption strategy, crop insurance shifts the insured's output risk to the insurer and reinsurer. Farmers must insure their crops in regions with high production risk so that they can receive sufficient compensation through indemnity payments in the event that a crop fails as a result of natural disasters like drought, flood, cyclone, hailstorm, hurricane, etc. Insurance helps farmers financially, stabilizes their farm revenue, encourages them to make agricultural investments, lowers debt, and lessens the need for relief efforts.

Globalization and climate change have become two of agriculture's biggest dangers in recent years. The production risk in agriculture has significantly increased due to climate change, which has caused a steady rise in temperature, increased rainfall variability, a rise in sea level, and an increase in the frequency, severity, and length of extreme weather events (IPCC, 2007) (Swain, 2014). Furthermore, the domestic market has become more integrated with the global food market due to the faster speed of globalization, which has significantly raised price risk (Swain 2008). The inadequacy of public action to address the issue of agricultural risk in the altered context of globalization is demonstrated by the high number of farmer suicides that have occurred in India in recent years in states like Maharashtra, Karnataka, Andhra Pradesh, and Odisha. In order to offer new, creative insurance solutions that meet the demands of farmers in the modern, altered environment, it is necessary to evaluate the effectiveness of the current crop insurance programs. Asymmetric knowledge between the insurer and the insured regarding the reason for crop failure is the main challenge in putting crop insurance schemes into practice. This can result in the twin issues of moral hazard and adverse selection. When an insurer purposefully changes his behaviour to raise the prospective loss's magnitude or probability, this is known as moral hazard. When people who buy insurance are at greater risk than those who do not, this is known as adverse selection. Because of this, monitoring and oversight are required, which costs the insurer a lot of money in transactions and administration(Hazell et al., 1986; Goodwin, 2001).Governments in developing nations typically use area-based and credit-linked index insurance plans to address these issues.

The Indian government has occasionally introduced a number of agricultural insurance programs after realizing the importance of crop insurance. Launched in 1999, the National Agricultural Insurance Scheme (NAIS) is presently being implemented in 27 Indian states. NAIS covers all important agricultural and food crops and covers yield losses from natural sources. In addition to being available to non-loanee farmers, NAIS is required for loanee farmers. This area-based crop yield insurance program covered 16.7 million farmers and 23 million hectares of cultivated land in 2011–12.Currently in operation in 19 states, the Weather Based Crop Insurance Scheme (WBCIS), also referred to as rainfall insurance, was first implemented on a pilot basis in 2007. WBCIS is available to all farmers and covers crop yield losses brought on by weather variations. The program addressed over 11.6 million farmers and 15.6 million hectares of land between 2011 and 2012. Rainfall is a more objective, measurable, and verifiable indicator than agricultural production. However, the government is quite concerned about the fact that less than 20% of all farming households in India have insurance.

2. Need and Importance of Crop Insurance

Despite the fact that agricultural insurance has been studied and used extensively, it is still unclear how much farmers value it in comparison to other risk management strategies (Skees, **2000**; Jensen *et al*., **2018**). Considering the magnitude and high level of exposure to various hazards, particularly in emerging nations, as well as the issues with basis risk with index insurance (Clement *et al*., **2018**), Large-scale, subsidized crop insurance programs with many periods of indemnity have been a key component of the government's risk mitigation approach (Hazell and Varangis, **2019**). When several issues coexist in crop insurance markets, it may even cause farmers to make unusual decisions about things like coverage duration (Babcock, **2015**; Huo *et al*., **2018**). India, which has seen a sharp increase in interest and a vigorous push for policy since 2016, offers an intriguing test case to examine the real need for indemnity-based crop insurance. Adoption rates have been generally unsatisfactory despite the fact that insurance against production loss from many risks has been in place for a long time. The Pradhan Mantri Fasal Bima Yojana (PMFBY), which was introduced in 2016 to replace the National Agriculture Insurance Scheme (NAIS), offers the latest experience. One of the biggest crop insurance trials in the world, it has insured about 55 million farmers since its inception, surpassing the previous scheme's enrollment by about 40%. Few farmers voluntarily buy insurance under the new PMFBY policy framework, despite the low cost and alluring terms. Just 25% of insured farmers bought insurance on their own initiative; the other 75% did so as part of mandatory loan default coverage; in particular, the program's design required that any farmer who applied for seasonal agricultural credit buy insurance. Although efforts

have been made to investigate the risk factors at the farmer level that affect product choice, there is little data available for determining crop insurance valuations for specific features. This top-down strategy, which excludes local stakeholders, especially farmers, from the planning process, may result in low program acceptance among target audiences and lower success rates for these development initiatives (Feder *et al*., **1985**). It brings up significant issues regarding the need for insurance in India as well as the general sustainability of the current regime. Without a basic evaluation of farmers' willingness-to-pay (WTP) for comprehensive crop insurance policies, none of these questions can be adequately addressed. In the meanwhile, any attempt to create a large-scale insurance policy with a high uptake rate is still unrealistic and lacks the market knowledge needed to increase its chances of success. Based on a discrete choice experiment (DCE) carried out in four geographically distinct Indian states, we close this gap by offering data on farmers' preferences for crop insurance policy features.

3. Overview of Crop Insurance in India

There is still much to learn about the true need for crop insurance in both industrialized and developing nations. In India, crop insurance is essential for shielding farmers from monetary losses brought on by natural disasters including floods, cyclones, droughts, pests, and illnesses. By reducing the risks associated with crop failure, crop insurance aims to protect farmers' incomes and advance agricultural sustainability(Chand et al., 20240.In India, the idea of crop insurance first appeared in the 1970s. In Gujarat, the first experimental program for H-4 cotton was implemented in 1972–1973. The National Agricultural Insurance Scheme (NAIS) was introduced in 1999, after the Comprehensive Crop Insurance Scheme (CCIS) was introduced in 1985(Chand et al., 2025). The Modified NAIS (MNAIS) was launched in 2010 with the goal of increasing coverage and operational effectiveness. Launched in 2016, the Pradhan Mantri Fasal Bima Yojana (PMFBY) is currently the main active initiative. It seeks to offer complete risk protection against crop loss brought on by unavoidable natural hazards. A small premium is paid by farmers under PMFBY: 2% for Kharif crops, 1.5% for Rabi crops, and 5% for commercial and horticultural crops. The government subsidizes the remaining amount. For quicker and more precise claim settlements, the program makes use of technologies like remote sensing, mobile-based crop cutting experiments, and satellite imaging. Notwithstanding its advantages, issues with delayed claim payouts, low farmer awareness, and restricted coverage of non-loanee farmers still exist. All things considered, crop insurance has emerged as a crucial instrument for managing agricultural risk and ensuring rural financial stability in India(Vyas et al., 2021).

With a total expenditure of ₹69,515.71 crore for the years 2021–2022 to 2025–2026, the Union Cabinet has approved the continuation of the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the Restructured Weather Based Crop Insurance Scheme (RWBCIS) through 2025–2026(Rajeev et al., 2023). With a fund of roughly ₹824.77 crore, the government established FIAT to enhance transparency, claim computation, and settlement timelines. WINDS, YES-TECH (Yield Estimation System utilizing Technology), and other technological tools are supported by this fund. In order to improve the implementation of PMFBY & RWBCIS, some changes and additions to the scheme provisions were approved together with the extension. A one-time special subsidy package of ₹3,850 crore was granted in conjunction with crop insurance decisions to keep Di-Ammonium Phosphate (DAP) fertilizer inexpensive (~₹1,350 per 50 kg bag), hence assisting farmers in lowering input costs under the aegis of supporting agriculture risk(Singh et al., 2023).

The gross cropped area insured under PMFBY for non-loanee farmers increased by around 70% from 106 lakh hectares in 2021–2022 to 180 lakh hectares in 2022–2023. Non-loanee area accounted for about **36.07%** of total insured area under PMFBY in 2022-23, the highest in the past five years. In prior years, this proportion was around 24-25%. States have defaulted more than ₹6,450 crore under PMFBY in the last five years (up to FY25). With ₹2,565 crore in defaulted claims at that time, Andhra Pradesh is among the top defaulters9 Rajeev et al., 2023). Madhya Pradesh (~₹1,468 crore) and Rajasthan (~₹1,525 crore) are two more significant states that have defaulted. There were still unresolved claims for the Kharif 2024 season, with some regions waiting over four months after harvest. Settlement delays can last for nearly a year in certain situations. State governments' delayed release of premium subsidy contributions has been cited as one of the causes(Murthy et al., 2022).

4. Crop Insurance Schemes in Andhra Pradesh

Since Kharif 2000, AP has been putting NAIS into practice. One noteworthy aspect is that, beginning Kharif 2008, AP has applied the "Village as Insurance Unit" strategy in every district. As a result, insurance is evaluated at the village level as opposed to per farm, which aids in loss representativeness. From Kharif 2016 to Kharif 2019, Andhra Pradesh introduced PMFBY and the Restructured Weather Based Crop Insurance Scheme (RWBCIS). AP has halted participation for a number of reasons, including budgetary limitations and worries over claim ratios during regular seasons. It returned to the Kharif 2022 season of PMFBY. Under the moniker Dr. YSR Free Crop Insurance, AP launched a free crop insurance program to alleviate farmers of the financial strain of premium payments. It has been integrated with PMFBY (Dr. YSRFCI-PMFBY) since 2022–2023. AP also announces the Restructured Weather Based Crop Insurance Scheme (RWBCIS) for the 2024–2025 year (Kharif 2024 & 2025; Rabi 2024-25 & 2025-26). Instead of using yield indices exclusively, it makes use of weather data like as temperature, rainfall, and so on as proxies(Mohammed et al., 2021).

All growers of notified crops in notified areas are intended to be covered by AP. For the Kharif season of 2024, the state government bears the premium under Dr. YSRFCI, therefore farmers are exempt from paying. At the seasonal or cluster level, AP has implemented ARSM with "cup & cap" (upper and lower limit of risk sharing) for 2024–2026. enrollment via digital crop survey (e-panta/e-crop booking) during certain seasons. Eligibility requirements include e-KYC authentication, biometrics, and Aadhar. Using yield data, claims for widespread/area risks (such as floods, droughts, etc.) are computed on an area basis. Localized hazards (such as hailstorms and floods) are evaluated on an individual basis, and the farmer must notify the relevant agency of the occurrence within a certain amount of time (usually 72 hours)(Kaur et al., 2021).

Approximately 35 lakh (3.5 million) farmers in Andhra Pradesh received benefits under PMFBY in Kharif 2022–2023. In June 2022, about 15.6 lakh farmers were compensated for Kharif 2021 losses with ₹2,900 crore through the YSR Free Crop Insurance program. Overall, claims of ₹7,802 crore were paid to about 54.55 lakh farmers under the Dr. YSR Free Crop Insurance program by Budget 2024–2025(Mohammed et al., 2021). AP is sticking with its universal free insurance concept for Kharif 2024, which is based on e-panta (digital crop survey). Voluntary enrollment will be restored starting in Rabi 2024–2025. Farmers must enroll (and, if necessary, pay a minimal premium portion) prior to the designated cut-off times through banks or CSCs(Kaur et al., 2021).

AP has a lot of unresolved claims. For instance, according to a recent study, claims totaling over ₹1,842 crore are still pending resolution. The state government must pay high rates for free insurance; occasionally, nonpayment results in claims being denied. Some farmers might postpone or skip the enrollment deadlines if the program is voluntary. Reliance on precise, if somewhat incomplete, digital crop data (e-crop, e-panta).ensuring farmers are informed on the eligibility requirements, the claim procedure, etc.

5. Review of Literature

Crop insurance is crucial for risk mitigation, but its sustainability depends on precise yield estimation and efficient premium pricing, according to Hazell et al.'s (1986) analysis of agricultural insurance schemes in developing nations, including India. The Comprehensive Crop Insurance Scheme (CCIS) has limited coverage, high administrative costs, and little awareness among small and marginal farmers, according to Mishra's (1995) analysis of the program's operation. Dandekar (1985) suggested a move toward individual risk assessment and the use of technology for crop loss estimation, arguing that area-based insurance models do not account for individual farm losses.

According to Raju and Chand's (2008) evaluation of the National Agricultural Insurance Scheme (NAIS), the program's efficacy was hampered by the lack of farmer education, the slow settlement of claims, and the restricted participation of non-loanee farmers. In their World Bank report on agriculture insurance in developing nations, Mahul and Stutley (2010) stressed the necessity of index-based insurance models and public-private partnerships for cost effectiveness and transparency.

By implementing standard premium rates, technology-based loss assessment, and expanded coverage, the Government of India (2016) addressed previous plan inadequacies with the introduction of the Pradhan Mantri Fasal Bima Yojana (PMFBY).In their examination of PMFBY implementation, Kumar et al. (2020) discovered that issues

including state premium payment delays and insufficient grievance redressal procedures continued to exist in spite of technology improvements.

In his 2013 study on the implementation of crop insurance in the districts of Guntur and Krishna, Reddy discovered that the majority of farmers relied on banks for enrollment since they were ignorant about the insurance process. Additionally, he saw a low claim ratio as a result of underreporting losses.

Anuradha and Satyanarayana (2015) evaluated NAIS and MNAIS in Andhra Pradesh and found that while coverage slightly increased, long claim settlements and inadequate compensation kept satisfaction levels low. In coastal Andhra districts, Kavitha and Sreelatha (2018) investigated the switch from NAIS to PMFBY. According to their research, PMFBY increased transparency and premium affordability, but it also necessitated improved field-level monitoring.

According to the Government of Andhra Pradesh's (2021) performance report, more than 49 lakh farmers benefited from the Dr. YSR Free Crop Insurance Scheme between 2019 and 2021, demonstrating increased involvement as a result of farmers no longer having to pay premiums. Ramakrishna (2022) discovered that although the digital e-Crop registration method guaranteed correct farmer data and reduced duplication, technical problems and internet accessibility persisted in remote areas. Nearly 35 lakh farmers profited from PMFBY in 2022–2023, according to The Hindu (2023), indicating a resurgence in farmer confidence following the state's re-entry into the national crop insurance system. Delays in claim payment, low farmer awareness, reliance on bank-linked enrollment, and financial strain on state exchequers are some of the recurrent problems identified in the examined literature. The impact of these programs in Andhra Pradesh after 2020 has not been thoroughly examined in many studies, especially since the Dr. YSR Free Crop Insurance Scheme and PMFBY were integrated. Thus, by evaluating the operational effectiveness, coverage, and farmer satisfaction under the existing Andhra Pradesh policy framework, the current study seeks to close this gap.

6. Farmer Awareness and Participation Levels

Studies reveal that many farmers are still ignorant of the full advantages and processes of crop insurance, despite several government initiatives. According to the Agricultural Insurance Company of India (AIC) statistics, a considerable proportion of insured farmers were automatically recruited as loanee farmers through banks, with inadequate comprehension of scheme features such as coverage, premium rates, and claim processes. Only roughly 45–50% of farmers in Andhra Pradesh were able to accurately explain how claims were computed or when they were qualified for compensation, according to field surveys conducted by agricultural universities (Acharya N.G. Ranga Agricultural University, 2022).

One of the main causes of low knowledge is the insurance industry's limited outreach. Insufficient training and information sharing by PACS and banks. Intricate documentation and no instruction in the local language. Some rural areas have low literacy rates.

The state's awareness levels have considerably increased since the Dr. YSR Free Crop Insurance Scheme was introduced. Insurance became more visible and relatable to farmers because to the "zero-premium" concept and marketing initiatives run by Rythu Bharosa Kendras (RBKs), Gram Sabhas, and village secretariats(Kusumalatha et al., 2022).

According to government data, farmer participation climbed from 22 lakh to over 35 lakh beneficiaries statewide between 2021 and 2023, and awareness levels improved by almost 30% during that time(Pradesh). The e-Crop registration system, which uses digital land records and Aadhaar to simplify enrollment, also made the process more transparent and easily accessible.

According to the PMFBY, voluntary enrollment gradually improved nationwide, with non-loanee farmer involvement rising from 24% in 2020–21 to 36% in 2022–23.

Because to the state's universal free insurance plan, Andhra Pradesh has a relatively higher participation rate (Chennamadhava et al., 2024).

Approximately 15.6 lakh farmers received insurance payouts during Kharif 2021. About 35 lakh farmers were covered by the PMFBY-YSR integrated plan for Kharif 2022–2023.Because of

digitization and better grievance redressal procedures, the insured area and claim frequency have also steadily increased(Srivani et al., 2022).

Several institutional and socioeconomic factors influence the degree of participation: Farmers with access to mobile-based information platforms and higher levels of education are more likely to sign up. While delayed or denied claims erode trust, farmers who receive timely compensation are more likely to re-enroll. Participation is positively impacted by the active involvement of banks, insurance coordinators, and RBKs(Kusumalatha et al., 2023). In recent years, confidence has increased through the use of village-level demonstrations, local language campaigns, and success stories(Chennamadhava et al., 2024)..

Despite advancements, a number of problems still exist: Due to disparities in outreach infrastructure, there is inconsistent awareness between the coastal and Rayalaseema districts. Some farmers have the misconception that insurance is only available to loanee growers. technological obstacles that prevent farmers without cell phones or internet connection from registering for e-crops. In other areas, delayed settlements continue to deter re-enrollment. Following the integration of PMFBY with the Dr. YSR Free Crop Insurance Scheme, Andhra Pradesh has demonstrated impressive advancements in farmer engagement overall. Farmers' confidence has increased as a result of awareness campaigns using RBKs and digital platforms. However, ongoing awareness campaigns, prompt claim resolution, and open implementation at the local level are necessary for long-term involvement(Ashrit et al., 2024).

7. Effectiveness of Implementation

How successfully the programs are run at the local level, including enrollment, claim resolution, transparency, and farmer satisfaction, will determine how well crop insurance is implemented in Andhra Pradesh. The two main programs in place in Andhra Pradesh are the Restructured Weather-Based Crop Insurance Scheme (RWBCIS) and the Pradhan Mantri Fasal Bima Yojana (PMFBY). Although the reach of these programs has significantly increased, there is still disagreement on their actual efficacy(Rao et al., 2021).

The use of digital technology for enrollment and claim monitoring through online portals such as the National Crop Insurance Portal (NCIP) has been one of the significant accomplishments. For a quicker and more precise loss assessment, the government has also implemented remote sensing instruments and Real-Time Governance (RTG) systems. Nonetheless, efficiency is still impacted by a number of fundamental issues.

Delayed claim settlements: Due to procedural snags in crop-cutting experiments and grant disbursement, many farmers must wait a long time to receive compensation. Insufficient knowledge and misunderstanding: Farmers, particularly those in isolated regions, lack a thorough understanding of the wording of the policy, the conditions of coverage, and the claims process(Raghavendra et al., 2023).

Bank-linked enrolment bias: Most enrolments come automatically through loanee accounts, resulting to decreased participation from non-loanee farmers. Inadequate grievance redressal procedures: Farmers frequently struggle to monitor the progress of claims or resolve disagreements .Low transparency: At the local level, the yield estimation and claim computation processes frequently lack transparency9 Rao et al.,, 2021).

Notwithstanding these problems, the government has improved accountability and decreased fraud through programs like e-KYC authentication, Aadhaar connection, and geotagging of insured plots(Raju et al., 2022).

Experts recommend prompt premium payments from governments, regional awareness initiatives, and streamlined claim processes using technology-driven strategies to increase efficacy even more.

8. Challenges and Limitations of Crop Insurance Schemes

One significant obstacle is farmers' inadequate knowledge of crop insurance's goals, advantages, and claim processes. Instead than seeing it as a safeguard, many farmers see it as a mandatory condition associated with crop loans. Low voluntary participation among non-loanee farmers is the result of this.

The claim disbursement delay is still a problem. Farmers' faith in the programs is weakened by months-long delays caused by convoluted processes, delayed reporting of yield data from crop-cutting studies, and sluggish financial transfers between state and federal authorities(Nirmal et al., 2021).

Loanee farmers continue to receive a larger share of crop insurance coverage than non-loanee and small/marginal farmers. Furthermore, because of problems with ownership-related documentation, tenant farmers and sharecroppers—who make up a sizable portion of Andhra Pradesh's agricultural workforce—frequently do not receive the benefits(Beula et al., 2021).

Despite the fact that PMFBY premium rates are subsidized, many farmers believe the total insured is not enough to compensate for actual losses. The scheme's financial protection value is diminished by the discrepancy between the insured amount and actual cultivation costs. Timely and trustworthy crop-cutting tests are essential for accurate yield estimation. However, insufficient staff, laborious data collection, and inconsistent procedures result in inaccurate loss assessments, which compromise the fairness and accuracy of claims(RATNAM et al., 2024).Real-time information regarding insured crops, claim status, and enrollment status is frequently unavailable to farmers. Lack of effective grievance redressal procedures also erodes systemic trust(Nirmal et al., 2021).Micro-level soil and climate fluctuations are not usually taken into consideration by the insurance framework. Unfair results may arise from a standard strategy used in all districts, particularly in a diversified state like Andhra Pradesh where agriculture and rainfall patterns differ greatly(Raahalya et al 2023).The implementation of the system involves a number of agencies, including government ministries, banks, and insurance firms. Data inconsistencies and administrative delays are frequently the result of poor cooperation between them.

In conclusion, although crop insurance programs have advanced in providing financial security, institutional inefficiencies, a lack of timely implementation, and insufficient farmer participation restrict their potential. A more robust agricultural insurance system must be achieved by implementing changes that prioritize openness, farmer education, prompt settlements, and tenant farmer inclusion in order to overcome these obstacles.

9. Impact on Farmers' Income and Risk Management

In India, especially in districts like Andhra Pradesh where agriculture is heavily reliant on monsoon conditions, crop insurance has become an essential tool for guaranteeing income stability and encouraging risk management among farmers. By covering yield losses brought on by natural disasters like drought, floods, or cyclones, crop insurance serves as a financial safety net for farmers. This guarantees that even in years of extreme crop failure, farmers will continue to receive a minimal wage(Mandala et al., 2021).

The Pradhan Mantri Fasal Bima Yojana (PMFBY), which covers crops including paddy, groundnuts, and maize—the state's staple—has been essential in stabilizing farm incomes in Andhra Pradesh(Birthal et al., 2021).

By giving farmers a sense of financial stability, crop insurance encourages them to invest in irrigation, buy higher-quality seeds and fertilizer, and embrace new agricultural technologies. This risk coverage encourages the farm sector to modernize and increase production over the long run.

As a component of a larger risk management framework, insurance plans assist farmers in better managing market and climate risks. The possibility of land abandonment is decreased when farmers are incentivized to continue farming despite unpredictable weather conditions. Crop insurance has become crucial in Andhra Pradesh due to the state's frequent cyclones, irregular rainfall, and insect assaults, particularly in the coastal and Rayalaseema districts. Compared to farmers without insurance, those who actively participate in PMFBY and other insurance programs report being more resilient and recovering from agricultural shocks more quickly.
In addition to providing financial security, crop insurance helps farmers feel less stressed and anxious, boosting their self-assurance and mental toughness against unforeseen losses. This supports rural livelihoods and indirectly promotes social stability.

Nevertheless these advantages, poor knowledge, restricted tenant farmer participation, and delayed claim settlements continue to limit the overall impact. Because of this, crop insurance's full potential to provide economic stability has not been equally realized in all Andhra Pradesh regions. In Andhra Pradesh, crop insurance has improved farmers' income and risk management in a mixed way. Even if insured farmers are more financially resilient and less vulnerable, all farming communities must benefit equally from ongoing efforts toward prompt implementation, inclusive engagement, and awareness-raising.

10. Comparative Analysis with Other States

A comparison of crop insurance systems in several Indian states offers important information about how well they are run and how Andhra Pradesh stacks up against the others in terms of coverage, benefits, and awareness. In contrast to the states with the greatest enrollments, such as Maharashtra, Madhya Pradesh, and Rajasthan, Andhra Pradesh has demonstrated moderate levels of engagement in the Pradhan Mantri Fasal Bima Yojana (PMFBY). Even while Andhra Pradesh's enrollment rate increased after 2018 as a result of digital registration activities, it still trails states like Maharashtra, where local coordination committees and state-level awareness campaigns have increased farmer participation, particularly among non-loanee farmers.

Because of successful village-level training programs and farmer hotline initiatives, farmers in states like Tamil Nadu and Karnataka continue to have a greater degree of understanding regarding insurance procedures and claim payment. Andhra Pradesh, on the other hand, still has poor voluntary enrollment due to information gaps, particularly among small and tenant farmers.

Andhra Pradesh experiences longer claim disbursement delays than Gujarat and Haryana, which have automated weather-based damage assessment systems in place.

Gujarat has increased claim transparency and drastically decreased manual errors by integrating weather indices and satellite data. While Andhra Pradesh has started using comparable digital systems, more interagency collaboration is required to guarantee on-time payouts. While Tamil Nadu employs drones to monitor agricultural conditions, states like Madhya Pradesh and Maharashtra have used smartphone apps and remote sensing to geo-tag insured fields. Implementation is slowed by Andhra Pradesh's heavy reliance on manual crop-cutting experiments, despite the state's introduction of real-time governance tools.

The exclusion of tenant farmers, who frequently lack land titles for insurance coverage, is one of Andhra Pradesh's main problems. Telangana and Odisha, on the other hand, have created regional insurance models or catastrophe compensation schemes that incorporate tenant cultivators and sharecroppers via self-declaration procedures.

According to surveys, Tamil Nadu and Gujarat have the most satisfied farmers since their claim settlements are quicker and more open. With insured farmers accepting the benefits but complaining about delayed payments and unclear claim computation, Andhra Pradesh ranks in the middle. Andhra Pradesh has made significant strides in putting crop insurance programs into place as compared to other Indian states, but there are still structural issues with knowledge, inclusion, and prompt claim payments.

Andhra Pradesh may improve its crop insurance delivery model and increase farmer satisfaction and risk resilience by taking inspiration from best practices in states like Maharashtra (awareness), Tamil Nadu (outreach), and Gujarat (technology use).

11. Government Initiatives and Policy Measures

In order to increase agricultural risk management, lessen farmer vulnerability, and fortify crop insurance programs, the Indian government has started a number of projects and policy changes in coordination with state governments. One of the main agrarian states, Andhra Pradesh, has introduced state-specific measures in addition to actively participating in these programs.

1. Initiatives at the National Level

(PMFBY, 2016) Pradhan Mantri Fasal Bima Yojana offers thorough risk protection for every crop that has been notified. Provides subsidized premiums of 5% for commercial/horticultural crops, 1.5% for Rabi crops, and 2% for Kharif crops. Uses technologically advanced technologies to speed up compensation, including as yield data, satellite photography, and mobile-based claim filing. Promotes coverage for all, even farmers who are not loanees.

Weather-Based Crop Insurance Scheme Restructuring (RWBCIS) created as an additional plan to compensate for losses brought on by weather-related hazards. Reduces claim settlement delays by determining compensation based on meteorological indices (temperature, rainfall, etc.).gives governments the freedom to implement the plan in accordance with local agroclimatic circumstances.

Technology and Innovation Fund (FIAT) encourages the use of technology to save operating costs, speed up claim settlement, and increase transparency. Includes automated yield assessment systems, GIS mapping, drones, and remote sensing.

State-Level Assistance and Coordination: State governments and the federal government split premium subsidies (50:50 for general states and 90:10 for northeastern states).States can contribute more money for free or reduced-premium insurance programs to insurance coverage.

2. Particular Projects for Andhra Pradesh

The Free Crop Insurance Program of Dr. YSR launched by the Andhra Pradesh government to provide farmers with free crop insurance at the enrollment point by paying the whole cost. In order to guarantee universal coverage, it was integrated with PMFBY starting in 2022–2023 and has raised involvement, particularly among marginal and small farms.

The e-Crop System and Digital Enrollment Through e-Crop portals connected to Aadhaar and land records, farmers can register online.

It speeds up the processing of claims, decreases duplication, and increases transparency.

Integration of Technology and Real-Time Governance (RTG) For precise yield estimation and crop monitoring, e-Panta surveys, satellite images, and geotagging are used. Aids in the prompt evaluation of extensive crop loss and the early identification of hazards. Programs for Farmer Awareness carried out by extension services, Gram Sabhas, and Rythu Bharosa Kendras (RBKs). explains the benefits of insurance, how to enroll, and how to file a claim.

3.Policy Actions to Enhance Execution

Timely Fund Release: In order to prevent claim delays, the federal and state governments are urged to release premium subsidies as soon as possible.

Tenant and Non-Loanee farms: The goal of policy initiatives is to extend coverage beyond bank-loanee farms.

Grievance Redressal Mechanism: Creation of online claim tracking platforms and specialized helplines.

Performance Monitoring: Consistent audits and monitoring to assess operational difficulties, participation rates, and the effectiveness of claim settlement.

Models of Alternative Risk Sharing (ARSM) introduced in 2024–2026 to use "cup & cap" systems (upper and lower limits of risk sharing) to manage financial risk between the state, insurer, and farmers. Guarantees steady funding for free insurance programs supported by the state. The government's proactive attitude to safeguarding farmers' income and managing agricultural risks is demonstrated by the combination of state-specific programs (e.g., Dr. YSR Free Crop Insurance, e-Crop registration) and central programs (PMFBY, RWBCIS). To optimize the efficacy of crop insurance in Andhra Pradesh, further improvements in awareness campaigns, technology adoption, and grievance redressal are required, even though these activities have increased participation and claim efficiency(Kumar et al., 2024).

12. Suggestions for Improvement

Even though Andhra Pradesh's crop insurance programs have advanced significantly, there are still a number of issues that could reduce their efficacy. The following recommendations are meant to improve farmer happiness, efficiency, and coverage. Organize frequent awareness campaigns at the village level using Gram Sabhas and Rythu Bharosa Kendras (RBKs).Explain the benefits of the plan, eligibility requirements, and claim procedures using informational materials in the local language (pamphlets, radio, and mobile messages).Provide extension agents with training materials to assist farmers in utilizing online resources such as e-Crop and claim tracking systems.

Utilize drones, satellites, and Internet of Things-based sensors to expedite crop-cutting trials and yield verification. Automate payment mechanisms to quickly transfer claims funds straight into farmers' bank accounts. Provide enough state funding ahead of time to avoid premium subsidy release delays.

Incorporate informal growers, sharecroppers, and tenant farmers by permitting self-declaration backed by village-level validation. Encourage non-loanee farmers to voluntarily participate by offering incentives and streamlining the registration process. With customized insurance policies, extend coverage to high-value and horticultural crops.

For quicker and more precise loss assessment, increase the use of satellite photography, GIS mapping, and real-time monitoring. Create a mobile application that allows farmers to monitor crop risk alerts, insurance enrollment, and claim status.

Incorporate weather forecasting data to anticipate possible losses and assist farmers in advance. Make enrollment, claim, and settlement data available to the public at the district and crop levels. Provide impartial grievance redressal procedures with precise deadlines for settling conflicts. To guarantee effectiveness and accountability, frequently review and audit the performance of insurance businesses.

To lessen financial strain, implement risk-sharing arrangements between the state, the federal government, and insurers. To guarantee sustainability without putting a strain on the state coffers, look into microinsurance solutions or tiered premiums for high-value crops.

Encourage private-public collaborations to enhance service delivery and launch cutting-edge insurance products. Conduct regular surveys and focus group talks to understand farmer satisfaction and areas for improvement. Involve farmer organizations and local cooperatives in the conception and execution of the program. By putting these strategies into practice, Andhra Pradesh's crop insurance programs may become far more inclusive, effective, and sustainable. The state can increase agricultural productivity, decrease susceptibility to financial and climatic shocks, and foster more resilience among its farming community by emphasizing awareness, technology, timely settlement, and farmer-centric policies.

13. Conclusion

Andhra Pradesh's crop insurance programs—in particular, PMFBY, RWBCIS, and the Dr. YSR Free Crop Insurance Scheme—have been essential in giving farmers financial stability in the face of crop failure, natural disasters, and climate uncertainty. Risk management, income stabilization, and farmer engagement have all significantly improved as a result of the adoption of these programs, especially for small and marginal growers.

Andhra Pradesh has achieved significant strides in digital enrollment, universal coverage, and state-backed premium support, which taken together have raised the number of covered farmers and, in many cases, accelerated reimbursement, according to a review of the literature and field-based observations. Transparency and operational efficiency have increased with the use of technologies like satellite-based yield estimation, geotagging, and e-Crop portals.

But there are still difficulties. The full potential of these programs is still being constrained by administrative bottlenecks, poor farmer knowledge, tenant and sharecropper exclusion, and claim settlement delays. While Andhra Pradesh has a robust government-backed strategy, comparison with other states shows that it can benefit from lessons learned from Gujarat (technology-driven assessments), Tamil Nadu (awareness and outreach), and Maharashtra (high involvement).

In order to increase the efficacy of crop insurance, ongoing efforts to educate and raise awareness among farmers. prompt and open procedures for settling claims. participation of all growers, including both non-loanee and tenant farmers. adoption of cutting-edge technology for assessment, monitoring, and grievance resolution. Methods for financial sustainability, such as public-private partnerships and risk-sharing.

In conclusion, Andhra Pradesh's crop insurance programs have improved farmer welfare and agricultural resilience. These programs have the potential to further reduce agricultural risks, stabilize farmer incomes, and support sustainable agricultural development in the state with thoughtful enhancements in coverage, implementation, and technology adoption.

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