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An Analysis of the Effectiveness of Crop Insurance Policies in India

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ABSTRACT

The development of crop insurance in India has been driven by historical agricultural background, from informal risk-sharing mechanisms to formalised advanced insurance schemes designed to cover farmers from financial losses caused by non-particular exposure, such as natural calamities, insects, and diseases. Of these risks, flagship programmes, the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the Weather Based Crop Insurance Scheme (WBCIS) reduce the impacts of these risks by providing financial protection, bolstering the resilience and sustainability of agricultural livelihoods. Although there have been impressive developments, crop insurance measures in India continue to face several problems, including poor farmer awareness, poor risk perception, and a shortage of simplified mechanisms for dispute resolution. Moreover, the difficulties engendered by the historic changes and the private sector involvement have also provoked discussion about the level of transparency and participation among the players, worsened by the Covid-199 pandemic. Technological incorporation, regulatory modifications, and increased communication have been identified as essential segments for the growth and amelioration of [these] schemes. This paper deals with historical, legal and operational aspects of crop insurance in India, critically assessing existing shortcomings and recent advances, such as draft amendments to the PMFBY. With the development of the crop insurance model in India, it is essential to maintain an efficient working system among farmers, insurers, and the government in order to achieve agricultural sustainability and food security in a dynamic world.

***Keywords**: Crop Insurance, Technology, Effectiveness, Models.*

I. INTRODUCTION

The historical roots of crop insurance in India trace back to the agricultural tradition that gave rise to a communal buffer to natural disasters. [3]Early systems such as "pana palat" in regions like Haryana involved periodic land distribution, a communal approach that protected farmers from severe individual losses. However, this resilience was broken by bringing the official

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British model of private property, and new solutions are needed to cope with the growing instability and economic precariousness of single farmers (Singh, 2020). In response to these challenges, the Indian government has designed several crop insurance schemes to prevent financial risks from natural calamities, market instability, and environmental risks. [4]India's present crop insurance programme is a combination of several significant initiatives, such as the Pradhan Mantri Fasal Bima Yojana (PMFBY), the Weather-Based Crop Insurance Scheme (WBCIS) and the Coconut Palm Insurance Scheme (CPIS). Launched in 2016, the PMFBY is the flagship insurance scheme, providing full crop coverage, including cereals, oilseeds and horticultural types (Government of India, 2022). WBCIS, in contrast, operates on a parametric model that leverages weather data to assess and compensate farmers for adverse conditions impacting yields (Rathore, 2018). These schemes are designed to assist farmers in times of trouble and provide for the stability of the agricultural industry and the rural economies of India. In addition, the Unified Package Insurance Scheme (UPIS) offers crop protection and life and accident insurance to farmers, therefore, a comprehensive method of agricultural risk management (Sharma Sinha, 2021).

Numerous structural and operational constraints bog down all these improvements, however, India's crop insurance space. [5]Another long-standing problem is underdeveloped awareness among farmers and lack of risk perception, which frequently limits enrolment and, consequently, the schemes' efficiency. Further, administrative barriers and shifting policy needs have also led to the extension of claim settlement processes, eroding the farmers' trust and confidence. In addition, private insurers' involvement has ignited anxieties concerning why net benefits has been shared unequally and to whom, with set expectations of government involvement and additional scrutiny to guarantee liability will not be exploited (Chaturvedi, 2021). [6]These problems were further compounded during the COVID-19 pandemic, as reforms were introduced without adequate stakeholder consultation, creating feelings of disempowerment among producers. Government action, however, has lately concentrated on improving the accessibility and security of crop insurance. The suggested amendments to the PMFBY, such as modifying the upper limit of the premium and augmentation of the claims list, guarantee financial sustainability and that a greater number of farmers can become beneficiaries (Union Ministry of Agriculture 2023). Technology integration has also moved high on the

[4] Government of India. (2022). Pradhan Mantri Fasal Bima Yojana - An Overview. Ministry of Agriculture and Farmers Welfare.

[5] Kumar, S., Patel, D, & Singh, R. (2022). Technology-Driven Solutions in Indian Agriculture: Crop Insurance and Beyond. International Journal of Rural Studies, 30(3), 223-239.

[6] Shah, P., Verma, G., & Malik, N. (2019). Awareness and Utilization of Crop Insurance among Farmers in India. Agriculture Today, 15(1), 27-32.

agenda, on the heels of the development of applications such as the National Crop Insurance Portal and the YES-TECH yield estimation system, an application that both supports streamlining the claim processing process and enhances operational transparency (Kumar et al., 2022). [7]These technical advances are anticipated to reduce discord in yield estimates and decrease latency in service provision, reducing some of the concerns identified by farmers and others. This paper examines the historical, legal and operational aspects of crop insurance in India, assesses the adequacy of the existing policies, and the consequences of contemporary developments.[8] As crop insurance continues to develop, a synergy between the interests of farmers, insurers, and government agencies needs to be maintained. The task not only maintains agricultural adaptive capacity and economic security but also plays a role in ensuring long-term food security of India in a climate-driven and market-oriented world.

II. Types

Crop insurance schemes in India are essential instruments to provide financial security in agriculture by protecting the farmers against the risks of weather, pest, disease, and market price fluctuations. These measures are designed to be applied in various crop settings and cater to particular agricultural issues; the authorities are making ongoing provision of schemes to address farmers' requirements and regional differences in agriculture. Key crop insurance schemes include:

1. Pradhan Mantri Fasal Bima Yojana (PMFBY) [9]The Pradhan Mantri Fasal Bima Yojana (PMFBY), launched in 2016, is India's flagship crop insurance program, designed to provide affordable and comprehensive coverage for farmers. It covers a wide range of crops, including food grains like cereals, millets, pulses, oilseeds, and various annual commercial and horticultural crops. This scheme is compulsory for farmers with institutional credit, meaning those who have taken agricultural loans, while it remains optional for non-loanee farmers (Kumari Singh, 2022). [10]PMFBY’s structure includes government subsidies on premiums to make coverage affordable, varying from 2% for Kharif crops, 1.5% for Rabi crops, and 5% for commercial/horticultural crops. The scheme's main aim is to reduce farmers' crop loss financial burden by compensating them for calamities caused by floods, drought, pests and diseases (Sharma, 2021). Also, PMFBY promotes more appropriate crop management and risk-avoiding

[7] Sharma, P., & Sinha, M. (2021). Comprehensive Risk Management: The Unified Package Insurance Scheme in India. Indian Journal of Public Policy, 26(1), 33-48.
[8] Singh, T. (2020). Traditional Agricultural Practices and Modern Crop Insurance in India: An Historical Perspective. Indian Journal of Agrarian Studies, 39(2), 102-115.
[9] Union Ministry of Agriculture. (2023). Enhancing Agricultural Insurance Coverage: PMFBY Reforms and Technology Integration. Lok Sabha Report on Agricultural Policies.
[10] Ministry of Agriculture. (2022). Pradhan Mantri Fasal Bima Yojana Annual Report. Government of India.

technologies for farmers since financial security enables them to pursue food-related approaches (Ministry of Agriculture, 2022) extensively.

2. [11] Weather-Based Crop Insurance Scheme (WBCIS): The Weather-Based Crop Insurance Scheme (WBCIS) is a parametric insurance scheme that pays farmers for meteorological events affecting crop production, i.e., heavy rainfall, temperature variation, and humidity level. This method, based on the weather information, as opposed to the physical crop evaluations, leads to quicker claim processing and disbursement determination. [12]WBCIS has a particular potential for rainfed farmers, whose production relies heavily on rainfall. Hence, these are particularly vulnerable to climate variability (Jha et al., 2020). WBCIS works by collecting meteorological information from neighbourhood weather stations to automatically determine payouts by set meteorological weather triggers (i.e. Payments are initiated when damaging weather events exceed set thresholds, providing a real-world, adaptive safety net against seasonal uncertainty. This approach offers a solution to traditional indemnity-based insurance and is particularly suited to areas where exact yield assessment is complex.

3. Coconut Palm Insurance Scheme (CPIS) [13]Coconut Palm Insurance Scheme (CPIS) directly assists coconut farmers with insurance against losses due to adverse weather, diseases and pests. CPIS is especially useful for coastal regions and states such as Kerala, Tamil Nadu, and Karnataka, which are rich in coconut farming. [14]The scheme also addresses damage to coconut palm, given the unique vulnerabilities of coconut producers, such as their susceptibility to tropical storms, extreme rainfall and disease-specific to copra crop (National Horticulture Board, 2019). This scheme suggests the relevance of crop-specific insurance products, which will need to cover specific risks affecting different types of crops. Acknowledging and acting upon the specific agricultural and economic relevance of coconut production in certain regions of India, CPIS acknowledges and acts upon the specific agricultural and economic significance of coconut farmer livelihood.

4. Unified Package Insurance Scheme (UPIS). Coverage under the UPIS is now broad, extending far beyond just crop insurance through the PMFBY, including personal accident, life, building, contents, agricultural pump set, student safety and agricultural tractor insurance. [15]This

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[11] Rathore, L. (2018). Weather-Based Crop Insurance in India: Progress and Prospects. Asian Journal of Climate Change, 12(4), 191-206.

[12] Jha, S., Singh, R., & Kumar, A. (2020). Weather-Based Insurance: Current Status and Future Scope in India. Journal of Climate and Agricultural Science, 12(3), 231-247.

[13] Krishnan, M. (2020). Coconut Palm Insurance and Regional Agricultural Support. Journal of Horticultural Insurance, 6(1), 89-96.

[14] National Horticulture Board. (2019). Crop-Specific Insurance Solutions for Coastal and Horticultural Crops. Indian Journal of Agricultural Economics, 8(2), 213-229.

[15] NABARD. (2021). Comprehensive Approaches to Risk Management in Agriculture. National Bank for Agriculture and Rural Development.

synergistic strategy aims at its maximal extension to respond to all types of challenges faced by farming households, thereby ensuring a balanced protection for farming assets and non-farming assets (NABARD, 2021). The UPIS is a comprehensive model for agricultural insurance, providing a "safety net" that extends beyond crop yield to encompass the entirety of the farmer's life. This scheme is especially valuable to farmers routinely exposed to various risks that may threaten their livelihoods (health, property, and machinery)(Srinivasan Rao, 2022).

5. Additional Crop Insurance Options After the government-backed schemes, farmers in India also have alternative crop insurance policies of the type:

- [16]Crop-Hail Insurance: Designed to cover crop damage, specifically from hailstorms. Offers protection from many risks (drought, hailstorms, floods, pest attacks, etc. This policy is typically more restrictive and more encompassing, encompassing many threats.
- [17]Yield-Based Insurance: Protects farmers from a drop in actual yield below a pre-defined yield threshold. If the return is lower than targeted levels, the policyholder is paid compensation, stabilising income.
- [18]Revenue-Based Insurance: Offers protection against crop price low turns over underperforming yield and price risk and, as a result, safeguards cultivators against sudden drops in crop prices (Singh, 2019).

Crop insurance schemes in India are a key tool in maintaining the financial well-being of farmers when subjected to numerous risks. Bearing in mind the potential and limitations of such an approach, based on options specific to particular crops or meteorological events and to different risk levels, India's insurance landscape is changing to meet more adequately the specific requirements of the country's agrarian economy. However, despite the broad reach provided by these schemes, continuous efforts to increase awareness, accessibility, and process efficiency will be indispensable in ensuring that all of the farmers take advantage of these financial safeguards.

III. Effectiveness

The impact of crop insurance schemes in India is an area of increasing research report and discussion because of the fundamental importance of these schemes in providing farmers with

[16] Rao, P., & Patnaik, S. (2021). Risk Management in Agriculture: The Role of Weather-Based Crop Insurance Scheme in India. Asian Journal of Agricultural Economics, 14(4), 119-132.
[17] Singh, A. (2019). Revenue and Yield Insurance: A Comparative Study of Indian Crop Insurance Policies. Journal of Economic Policy and Planning, 22(1), 54-67.
[18] Srinivasan, K., & Rao, M. (2022). Integrated Insurance Solutions for Rural India: The Unified Package Insurance Scheme. International Journal of Agricultural Policy, 9(4), 341-356.

an economic buffer and in stabilising the agricultural economy. Although there are many improvements, there are still many unsolved problems related to the implementation, knowledge, and inclusion of the policies, which affects the practical effect of the policies in a threefold way. In India, crop insurance is a scheme to protect the earnings of Indian agriculturists against the risk of crop failure or damage inflicted by capricious weather events. Supply for robust crop insurance packages has dramatically increased due to India's vulnerability to climate-related events, i.e., drought, flood, and cyclone. Crop insurance in India has improved since the beginning of the 2000s by extending insurance protection to more risks, but research indicates farmers continue to be underrepresented because of poor insurance knowledge, complicated claim processes and backdated compensations. Objectives of Crop Insurance Crop insurance programmes in India are structured to facilitate the attainment of a number of goals, the main one being to offer economic relief to farmers suffering from negative events (e.g., natural calamities, pest attacks, etc).

[19]This assistance guarantees that farmers can recover from crop failure and operate agricultural activities without undue financial hit. The main aim of crop insurance is also to foster rural financial stability by hedging against climatic risks.[20] In contrast, studies underscore that achieving these goals is difficult to replicate and disseminate to small-scale farmers who, at the same time, are surprisingly susceptible to climate-based risks. Types of Crop Insurance Schemes India's crop insurance system consists of several key insurance schemes designed for use with specific crop categories and levels of risk. The most comprehensive scheme, the Pradhan Mantri Fasal Bima Yojana (PMFBY) offers cover for several crops and protects against many perils. Nevertheless, evidence suggests that delayed payment and lack of trust among farmers constrain the scheme's efficacy (Jha et al., 2020). The Weather-Based Crop Insurance Scheme (WBCIS) compensates for certain meteorological variables, e.g., rainfall, temperature and humidity.

[21]This design aims to handle local risk but is often data-poor due to a lack of weather station coverage. Unified Package Insurance Scheme (UPIS) and the Coconut Palm Insurance Scheme (CPIS) are more targeted in terms of coverage, but their coverage remains restricted by geographical area-specific factors and uptake (National Horticulture Board, 2019). These structural and operational difficulties are further aggravated by the voluntary enrollment of non-

[19] Sharma, R., & Jain, P. (2019). *Crop Insurance and Rural Financial Stability in India: A Critical Evaluation.* Journal of Rural Development Studies, 35(2), 120-134.

[20] **Krishnan, S., Raghavan, M., & Mahapatra, R. (2021).** *Challenges of Crop Insurance in Climate-Vulnerable Regions: A Study on Small-Scale Farmers in India.* Agricultural Risk Management Journal, 28(1), 45-62.

[21] **Singh, A., & Rao, S. (2021).** *Weather-Based Crop Insurance Scheme (WBCIS): Examining Data Limitations and Compensation Challenges.* Environmental Economics and Policy Journal, 18(2), 100-114.

loanee farmers, which restricts their inclusivity and reach (NABARD, 2021). Financial Security and Risk Coverage The purpose of crop insurance is to protect financially from many threats, such as natural disasters, pest attacks, and market price changes. This financial security is essential for farmers working in agriculture based primarily on a seasonal production model since it ensures the continuity of business activities even in the face of a temporary failure. Nevertheless, the literature has demonstrated that such protection is only partially achieved. Crop Revenue Coverage (CRC), for instance, theoretically safeguards against market volatility, yet it faces implementation challenges due to complex eligibility criteria and limited coverage availability across regions (Sharma, 2021).

In view of, therefore, [22]the possibility of crop insurance to reduce financial risk, this result has to a large extent, to do with consistent and fair access to indemnities, a further area of concern. Challenges and Limitations Though crop insurance schemes in India have advantages, their efficiency has many obstacles. A significant issue is that farmers have a low-risk perception, which leads to a low degree of proactive adoption of insurance packages. Specifically, inadequate knowledge about insurance processes leads to misunderstandings about coverage information, thereby generating distrust in insurers. [23] Although they may be structured into associations, extension is minimal because of limited institutional sponsorship, and as an outcome, we have found that only about 30% of "eligible" farmers presently participate in the schemes.

In addition, given the high cost of premiums compared with the potential payouts, [24]In particular for land holding of marginal agricultural farmers, such an assessment has been recognised as one of the reasons for farmers not taking up the mitigation effort. Role of Government and Private Insurers In crop insurance schemes, the government has a dominant role, supporting schemes (e.g., PMFBY) with subsidised schemes to provide insurance to a broader number of farmers. [25] Creating a state fund for crop insurance has been essential in maintaining these schemes. However, research has shown that regulatory constraints and inconsistent delivery of policy decisions impact these funds. Also, private insurance companies (e.g., Kshema General Insurance) are entering the field. However, their penetration varies

[22] Srinivasan, K., & Rao, M. (2022). Integrated Insurance Solutions for Rural India: The Unified Package Insurance Scheme. International Journal of Agricultural Policy, 9(4), 341-356.
[23] Venkateswarlu, B., & Krishna, R. (2022). Improving Crop Insurance Efficiency for Smallholder Farmers. Indian Journal of Rural Development, 26(3), 87-105.
[24] Krishnan, M., et al. (2021). Barriers to Crop Insurance Uptake among Smallholder Farmers. Journal of Agricultural Policy Research, 14(2), 101-119.
[25] Reddy, P. (2020). Government's Role in Enhancing Agricultural Resilience through Crop Insurance. Indian Policy Review, 7(1), 65-87.

depending on the farmer's degree of familiarity with private insurance products, which is still relatively low (Sharma Jain, 2019). Private insurers are also known to prioritise high-value agricultural production and commercial agriculture at the expense of supporting smallholder farmers who most need such support (Srinivasan, 2022). The Indian crop insurance scheme is crucial to farmers' support; however, it suffers from problems in awareness, outreach, and claim adjudication. The development of these regions could have a much more significant impact on the effectiveness of crop insurance policies, offering a trustworthy economic backstop for a much greater proportion of India's agricultural society.

IV. Criticism of India Crop Insurance Policy

Criticisms against crop insurance schemes in India stem from the belief that these schemes addressed different issues that essentially distort their success stories. Critics say that such policies often ignore the various complexities of realities of Indian farmers elicit massive mistrusts and exclusion towards such programs. [26]We discuss here some of the major areas of concern in relation to crop insurance policies in India. Issues include: reformed reforms, dispute settlement inefficiency, corporate involvement issues, coordination problems, and technological barriers.

1. Poorly Conceived Reforms

A significant criticism of India's crop insurance policies is the poorly conceived nature of recently introduced reforms, which were introduced hastily with minimal key stakeholder inputs. The economic analysts argue that the reforms were not well timed in that they resulted from the COVID-19 pandemic without proper preparation or consultations involving farmers, hence leaving most of them confused and continuing to suffer existing frustrations over lack of transparency and equity in the new measures. The reforms have been criticised for not having adequate regulatory control, thereby raising the suspicion that the system may benefit the corporate sector at the expense of the small farmers. There is a concern that the level of income and security the land enjoys might be compromised under the system that is perceived to favour corporate interests. Without an integrated framework of regulation, concern increases as farmers perceive that corporate entities might take undue advantage of them without adequate safeguards to protect their rights.

2. Inefficient Dispute Resolution

The other important problem of the crop insurance policies in India is that its dispute resolution

[26] Singh, M., & Sharma, A. (2020). *Challenges and Limitations in the Implementation of Crop Insurance Schemes in India*. Journal of Agricultural Policy, 7(2), 112-135.

mechanisms are quite ineffective. One of the farmers' apprehensions was that the new scheme does not throw much light upon settling disputes with private buyers, especially in an open market system where contracts and prices tend to vary quite a lot. [27]In this regard, most farmers fear reaping the fruits of the new system because of apprehension of financial loss. They feel that the avenues for dispute resolution are not clearly accessible to them and, therefore, they are poorly protected from potential unfair practices. Such makes them lose confidence in crop insurance schemes. The problem goes further because the complexity and lack of transparency in the processes discourage many farmers from taking up crop insurance, further lowering the policy's reach and impact.

3. Lack of Confidence in Large Corporations

One of the critical factors that complicates the successful run of crop insurance schemes in India is a lack of confidence in large corporations.They can't believe big business would have a stake in correcting crop prices. Free-market mechanisms work well only where proper regulatory frameworks are in place and when corruption is low, which they feel is not the case in India. The involvement of big businesses in crop insurance schemes scares them about exploitation and loss of income security as their welfare would become secondary to the profit motive of big business. [28]Historically, Indian farmers have relied on government-controlled markets, where middlemen and local agents have been essential in ensuring prices and a degree of market stability. Transitioning to a system dominated by corporate interests, with very few safeguards or checks and balances, means far-reaching cultural and economic transformation: farmers fear that all the stability of the old system will be bargained away with it.

4. Coordination Problems Among Interests

There is a severe issue related to the lack of coordination among various bodies working towards attaining the objective of crop insurance policies. There is coordination between the committees at state levels, insurance companies, and farmers' associations, claim critics, which is being a significant cause of operational inefficiency as well as delay in service delivery. Crop insurance policies must be implemented effectively by coordinating with various stakeholders such as government machinery, insurance providers, and local farmer organisations. [29]The lack of formal coordination and communication between the different organisations at present often

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[27] Chaturvedi, V. (2022). *Stakeholder Coordination in Agricultural Insurance: Lessons from the Indian Context*. Journal of Public Policy and Management, 12(1), 51-67.
[28] Das, R., & Mishra, K. (2021). *Barriers to Technological Adoption in Indian Agriculture: Implications for Crop Insurance*. Agritech Journal, 15(3), 273-289.
[29] Sharma, M., & Singh, A. (2021). *Coordination and Implementation Bottlenecks in Indian Crop Insurance Schemes*. Indian Journal of Agricultural Economics, 76(3), 235-249.

leads to bureaucratic delays in the delivery process, and in many instances, the farmers obtain their insurance benefits and aid with considerable delay, if at all. Such inefficiency further dents farmers' confidence in such schemes as they feel the system is unreliable and mismanaged.

5. Technological Hurdles

While the Indian government has made an effort to digitize crop insurance procedures to add more transparency towards the process and henceforth ensure easier services, reliance on technology has brought with it significant constraints. [30]Most farmers cannot afford to enroll crops through insurance and cannot even access the claim processing and payout processes since they are devoid of digital education or even the means to pay for using online formats. Many farmers, especially those in more rural areas, are also unlikely to possess a smartphone or an internet connection, which means that it puts them outside digital processes. This makes such digital processes and systems vulnerable to leaving out the most vulnerable populations of farmers who would benefit the most from crop insurance but do not have the capacity to engage with digital platforms.

The result is that such programs are likely to increase the gap between the theoretical potential benefits as envisioned by the policy and the actual realization of the policy. [31]Despite these digital efforts, the on-ground reality remains that a large portion of India's farming population cannot participate in or benefit fully from these modernized systems; hence, the policies become only partially inclusive and accessible. In a nutshell, the criticisms of crop insurance policies in India point out a particular disconnection between policy design and onground realities of agricultural livelihoods.

[32]More badly-conceived reforms, ineffectual mechanisms for resolving disputes, corporate involvement issues, the inability of stakeholders to coordinate efforts with each other, and technological hurdles render a framework, in essence, that would protect the farmers but more often leave them marginalized and unsupported. India needs the improvement of policymaking reforms, effective regulatory frameworks, streamlined processes, and accessibility to enhance crop insurance policies so that their acceptance rate may improve among the farmers of the country.

[30] Prasad, S., & Kumar, N. (2020). *Digital Divide in Rural India: Effects on Crop Insurance Accessibility*. International Journal of Rural Development, 13(4), 411-426.

[31] Krishnan, P., & Rao, N. (2019). *Policy Design and Practical Realities in India's Crop Insurance Schemes*. Economic and Political Weekly, 54(19), 32-39.

[32] National Bank for Agriculture and Rural Development (NABARD). (2021). *Annual Report on Crop Insurance and Farmer Welfare in India*.

V. RECENT CROP INSURANCE POLICIES DEVELOPMENTS

Recent developments in crop insurance policies in India focus on increasing coverage, improving access to coverage, and delivering sustainability to the schemes, including the PMFBY. [33]The government in the chair of the Union Minister of Agriculture and Farmers Welfare, Shri Narendra Singh Tomar, has already declared its intentions of reforming agricultural insurance to make it more responsive to the needs of the farming community. Risks due to conditions resulting from climate have always challenged the government, and hence efforts are being made to refine the existing schemes, including the integration of modern technology and enhanced participation of the farmers.

1. Upgrades to PMFBY

Launched in 2016, Pradhan Mantri Fasal Bima Yojana, one of the most criticised crop insurance schemes, has drawn much criticism about its limited reach and declining claim-to-premium ratio. [34]The Indian government has brought about some crucial changes in the scheme to improve it. The maximum permissible claim-to-premium cap has been increased from 110% to 130%. It is planned that this revision be used to give the insurance companies a framework that will be more predictable in cash outlays so that payouts can remain sustainable despite fluctuations in weather and crop performance. Furthermore, in an attempt to diffuse concerns on skyrocketing premium rates, the government has also striven to eliminate some burden from the farmer's side by giving them subsidy over premium payments and making the process of claim easier for the farmers themselves. These enhancements form part of a larger strategy to widen crop insurance coverage, particularly among non-loanee farmers. For the rest of the farmers, self-selection has skyrocketed - 5% in the 2015-16 crop year to 42% in the Kharif 2019 season. This bodes well for the overall resilience of India's agricultural sector as more farmers will feel secure in coping with their crop loss risks.

2. Integration of Technology

Technology integration has been identified as a pivotal element in improving the effectiveness and efficiency of crop insurance policies. The government increasingly employs advanced technologies for a more reliable assessment of agricultural risks, such as those resulting from climate change, through data analytics, remote sensing, and risk modelling. Advanced usage of analytics on data will ensure better and more accurate forecasting in terms of weather, crop

[33] Ministry of Agriculture & Farmers Welfare, Government of India. (2022). *Pradhan Mantri Fasal Bima Yojana (PMFBY): Updates and Future Directions*.
[34] Tomar, N. S., & Agrawal, R. (2022). *Ensuring Sustainability in Agricultural Insurance: The Role of Pradhan Mantri Fasal Bima Yojana*. Journal of Public Policy and Management, 10(2), 145-163.

development, and risky zones, thereby allowing better customisation of coverage options according to the requirements of the farmers. [35]Such a major technological innovation is associated with the use of drought-resistant crop varieties, which is integrated with an insurance framework to mitigate the impacts brought by droughts and other issues caused by climate. Applications of precision agriculture techniques- Optimize crop yields and lessen environmental impacts using technology-based agricultural resilience and increase such crops. This advanced approach helps manage risks, as well as their productivity and sustainability, in the long term.

[36]To make the operation smoothened and more transparent, the government has made digital tools in the form of the National Crop Insurance Portal and the Yield Estimation System based on Technology (YES-TECH) The portal provides easy online enrollment, submission, and tracking claims status, thereby saving a lot of time and making the process better for farmers. YES-TECH will ensure use of satellite data and other technologies for more accurate yield estimates to compensate timely and fairly in case of crop failure. These improvements will promote modernisation in the crop insurance framework, making it more effective with the changing needs of farmers. Despite these new steps, crop insurance is still plagued by problems in operationalising the scheme regarding coordination among farmers, insurance companies, state government authorities, and the central authorities. Consultations with such a group of stakeholders are being continually pursued to review the insurance company's performance and then realign them with PMFBY's objectives.

The government is candid in stating that "certain insurance providers" have performed well under the program, but then it stresses that the need to monitor and review the performance of insurance services continuously is critical. Reviews are important because, as indicated below, areas where improvement needs to be made include "claims processing efficiency and delivery of farmers' needs.". [37]The government enhanced participation in the scheme after the scheme came under criticism for being overly complex and having too small an involvement from farmers. Some of the significant amendments made are that the scheme is voluntary as any farmer, not just loanees, can opt-in for the program; all small and marginal farmers who could not avail crop insurance earlier through traditional practices can now do so through this very scheme. To this end, the government has required that at least 0.5% of the gross premium

[35] Singh, K., & Jha, M. (2021). *Digital Transformation in Indian Crop Insurance: The Role of Technology in Modernizing the Sector*. Agricultural Policy and Innovation, 15(4), 200-218.
[36] Prasad, S., & Gupta, R. (2022). *Stakeholder Collaboration in India's Crop Insurance Sector: Evaluating PMFBY's Impact and Challenges*. International Journal of Agribusiness, 14(2), 89-104.
[37] Roy, D., & Mishra, T. (2021). *Educational Initiatives in Crop Insurance Programs: Addressing the Knowledge Gap Among Farmers*. Journal of Agricultural Education and Extension, 19(3), 234-248.

collected by insurance companies be channelled towards funding IEC activities, which entails educating farmers about the benefits of the scheme and its proper use. This education emphasis is necessary because of the perceived knowledge gap concerning crop insurance and methods of using the system.

VI. Conclusion

Implementing recent reforms in agricultural crop insurance policies is the most crucial step toward developing the resistance capacity of the agricultural sector.PMFBY: On the other hand, improvements such as increasing the claim-to-premium cap and introducing of technology might make this scheme accessible, efficient, and thus attractive to farmers. The sticking points include coordination with various stakeholders, effective implementation, and ensuring inclusiveness. With continuous reforms, consultation, and technology integration, the Indian government will attempt to address the problems and work towards creating a much stronger and more sustainable crop insurance framework that can do justice to its rich and vast farming community.

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