



Strengthening Farmer Financial Resilience Against Hydrometeorological Disasters Through the Performance Evaluation of National Rice Crop Insurance Schemes

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ABSTRACT

Hydrometeorological disasters, including floods, droughts, extreme rainfall, and climate variability, increasingly threaten rice production, causing substantial economic losses and weakening farmers' financial resilience. National rice crop insurance schemes have been introduced as risk management instruments to reduce production losses, stabilize farm income, and strengthen farmers' adaptive capacity to climate-related disasters. This study evaluates the role and performance of national rice crop insurance schemes in strengthening farmers' financial resilience against hydrometeorological disasters through a systematic literature review. A qualitative Systematic Literature Review (SLR) was conducted by synthesizing 20 peer-reviewed journal articles published between 2015 and 2026. The studies were retrieved from Scopus, ScienceDirect, SpringerLink, Wiley Online Library, Taylor & Francis, MDPI, Google Scholar, and SINTA-accredited journals using keywords related to rice crop insurance, agricultural insurance, financial resilience, hydrometeorological disasters, climate risk, and disaster risk management. The findings suggest that national rice crop insurance schemes can enhance farmers' financial resilience by reducing post-disaster income losses, improving access to agricultural credit, encouraging investment in farm inputs, and supporting production recovery following climate-related shocks. However, program effectiveness depends on premium subsidies, claim settlement efficiency, farmer awareness and participation, institutional capacity, accessibility, and integration with broader climate adaptation strategies. Strengthening insurance governance, expanding coverage, adopting digital technologies for damage assessment, and integrating crop insurance with comprehensive disaster risk management policies are essential to improving the long-term financial resilience and sustainability of rice farming systems under increasing hydrometeorological risks.

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1. Introduction

Rice is one of the world's most important staple food crops and serves as the primary source of livelihood for millions of farming households, particularly in developing countries. As global food demand continues to increase alongside population growth, maintaining stable rice production has become a strategic priority for ensuring food security and rural economic development. However, rice production remains highly vulnerable to climate-related hazards because cultivation depends heavily on favorable weather conditions, water availability, and seasonal climate patterns. Consequently, climate variability and extreme weather events have become major challenges threatening the sustainability of rice farming systems worldwide [1].

Hydrometeorological disasters, including floods, droughts, tropical storms, prolonged rainfall, and extreme temperature fluctuations, have been increasingly reported in recent decades, with climate change identified as one of the contributing factors. These disasters frequently result in crop failures, declining agricultural productivity, damaged farming infrastructure, and substantial economic losses for farmers. Smallholder rice farmers are particularly vulnerable because they generally possess limited financial resources, inadequate access to formal credit, and insufficient savings to recover from production losses. Repeated exposure to hydrometeorological disasters therefore weakens household income, reduces investment capacity, and increases the likelihood of persistent rural poverty [2].

Financial resilience has become an increasingly important concept in agricultural risk management because it reflects farmers' ability to anticipate, withstand, recover from, and adapt to financial shocks resulting from natural disasters and climate variability. Financially resilient farmers are better able to maintain agricultural production, continue investing in farming activities, repay financial obligations, and preserve household welfare despite experiencing production losses. Strengthening financial resilience has therefore become a key objective of agricultural policies aimed at improving long-term sustainability and reducing disaster-induced vulnerability within rural communities [3].

Agricultural insurance has been widely recognized as one of the most effective financial risk management instruments for protecting farmers against production losses caused by natural hazards. Unlike traditional disaster assistance programs that often provide compensation only after severe disasters occur, crop insurance offers pre-arranged financial protection by compensating farmers for eligible production losses. By reducing income uncertainty, agricultural insurance encourages farmers to adopt improved production technologies, increase



investment in agricultural inputs, and maintain farming activities despite increasing climate risks [4].

Many countries have introduced national rice crop insurance schemes as part of broader agricultural and climate adaptation policies. Countries such as Japan, China, India, South Korea, the Philippines, Vietnam, and Indonesia have implemented government-supported insurance programs to stabilize farm income, enhance food security, and strengthen farmers' resilience against climate-related disasters. These schemes generally involve government premium subsidies, institutional cooperation among insurance providers and agricultural agencies, and standardized procedures for damage assessment and claim settlement. Although program designs differ across countries, they share the common objective of reducing farmers' financial vulnerability while supporting sustainable agricultural development [5].

In Indonesia, the Rice Farming Insurance Program (*Asuransi Usaha Tani Padi*—AUTP) was introduced to provide financial protection against crop failures resulting from floods, droughts, and pest or disease outbreaks. The program represents one of the government's principal strategies for mitigating agricultural risks while promoting production stability and farmer welfare. Since its implementation, AUTP has been associated with reductions in farmers' economic losses following disasters and greater participation in formal agricultural risk management. Nevertheless, several implementation challenges remain, including limited insurance coverage, low farmer participation, inadequate awareness of insurance benefits, delays in claim settlement, and institutional constraints that affect program effectiveness [6].

Previous studies suggest that agricultural insurance may contribute to farm income stability, investment decisions, and post-disaster recovery. Insurance participation has also been associated with improved access to agricultural credit because financial institutions generally perceive insured farmers as lower-risk borrowers. Furthermore, insurance reduces production uncertainty, enabling farmers to adopt higher-value agricultural technologies and increase productivity. However, empirical findings also indicate that the overall effectiveness of crop insurance depends on multiple factors, including premium affordability, institutional capacity, farmer education, digital technology adoption, claim transparency, and policy integration with broader climate adaptation initiatives [7].

Despite the growing body of literature on agricultural insurance and climate risk management, existing studies have generally focused on individual countries or specific aspects of insurance performance, such as farmer participation, premium subsidies, or claim effectiveness. Relatively few studies have comprehensively synthesized empirical evidence regarding how national rice crop insurance schemes strengthen farmers' financial resilience against hydrometeorological disasters across different institutional and policy contexts. A systematic synthesis of existing research is therefore necessary to identify common success



factors, implementation challenges, and policy implications that can improve the effectiveness of future insurance programs.

Accordingly, this study aims to evaluate the performance of national rice crop insurance schemes in strengthening farmer financial resilience against hydrometeorological disasters through a systematic literature review. By synthesizing empirical findings from twenty peer-reviewed journal articles, this study seeks to identify key factors associated with insurance effectiveness, examine the contribution of crop insurance to financial resilience, and develop policy recommendations for enhancing disaster risk management and promoting sustainable rice farming systems under increasing climate uncertainty [8].

2. Materials and Method

This study employed a qualitative research approach using a Systematic Literature Review (SLR) to evaluate the performance of national rice crop insurance schemes in strengthening farmer financial resilience against hydrometeorological disasters. The SLR approach was selected because it enabled a comprehensive synthesis of empirical evidence from previous studies while identifying consistent findings, research gaps, and policy implications regarding agricultural insurance and disaster risk management. Compared with conventional literature reviews, a systematic review applied transparent and reproducible procedures for identifying, screening, and analyzing relevant scientific publications for identifying, screening, and analyzing relevant scientific publications, thereby supporting a systematic and transparent synthesis of the reviewed literature [9]

The literature search was conducted using several internationally recognized academic databases, including Scopus, ScienceDirect, SpringerLink, Wiley Online Library, Taylor & Francis Online, MDPI, Google Scholar, and SINTA-accredited Indonesian journals. These databases were selected because they provide broad coverage of high-quality publications in agricultural economics, climate change adaptation, disaster risk reduction, and agricultural policy.

To obtain relevant studies, combinations of keywords were employed using Boolean operators ("AND" and "OR"). The primary search terms included "rice crop insurance," "agricultural insurance," "farmer financial resilience," "hydrometeorological disasters," "climate change," "flood," "drought," "crop failure," "disaster risk management," "agricultural risk," "insurance performance," and "rice farming." The search strategy was designed to capture studies discussing the relationship between agricultural insurance, disaster risk, farmer resilience, and policy performance across different countries and institutional contexts.

The inclusion criteria consisted of peer-reviewed journal articles published between 2015 and 2026 that investigated rice crop insurance, agricultural insurance, climate-related agricultural



risks, hydrometeorological disasters, farmer resilience, disaster recovery, or agricultural risk management. Only full-text articles written in English or Indonesian were included. Studies focusing exclusively on livestock insurance, non-agricultural insurance, theoretical papers without empirical evidence, conference proceedings, book chapters, unpublished reports, theses, and duplicate publications were excluded to ensure the consistency and scientific quality of the review.

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedure, the literature selection consisted of four stages: identification, screening, eligibility, and inclusion. The initial database search identified 112 publications. After removing duplicate records and screening titles and abstracts, 46 articles remained for full-text assessment. Based on the predefined inclusion and exclusion criteria, 20 peer-reviewed journal articles were ultimately selected for detailed qualitative synthesis because they directly addressed the effectiveness of rice crop insurance schemes and their contribution to strengthening farmers' financial resilience against hydrometeorological disasters.

The selected studies represented diverse geographical contexts, including Indonesia, China, India, Japan, Vietnam, Bangladesh, the Philippines, Pakistan, and several African countries. Including studies from multiple countries enabled comparative analysis of different insurance policy designs, implementation mechanisms, institutional arrangements, and disaster management strategies. This diversity also provided broader insights into how national crop insurance programs operate under varying climatic, socioeconomic, and policy environments.

Data from each selected article were systematically extracted using a standardized review matrix. The extracted information included publication year, country of study, research objectives, methodology, type of insurance program, disaster characteristics, indicators of financial resilience, major findings, implementation challenges, and policy recommendations. This structured extraction process was intended to maintain consistency throughout the review while facilitating comparisons among different studies.

The collected literature was analyzed using thematic content analysis, which involved identifying recurring concepts, empirical relationships, implementation barriers, and policy implications related to rice crop insurance and farmer financial resilience. The findings were synthesized into four major analytical themes: (1) hydrometeorological disaster impacts on rice farming, (2) performance of national rice crop insurance schemes, (3) the contribution of crop insurance to farmer financial resilience, and (4) policy strategies for strengthening agricultural disaster risk management. Organizing the literature into thematic categories facilitated the interpretation of current evidence and the identification of common patterns across different national contexts



To support the quality of the synthesis, greater emphasis was placed on studies that presented clear methodological procedures and empirical findings relevant to the review objectives. Differences among studies were critically compared to identify both convergent and divergent evidence regarding insurance effectiveness, farmer participation, premium subsidy mechanisms, claim settlement efficiency, and institutional performance. This analytical approach supported the synthesis of evidence regarding how national rice crop insurance schemes may contribute to strengthening farmer financial resilience amid increasing hydrometeorological disaster risks.

3. Result

The synthesis of the twenty selected journal articles suggests that national rice crop insurance schemes have become an increasingly important policy instrument for reducing farmers' vulnerability to hydrometeorological disasters. Across the reviewed studies, crop insurance contributes to financial resilience by providing compensation for production losses, stabilizing farm income, facilitating access to agricultural credit, and encouraging farmers to continue investing in agricultural production despite increasing climate risks. Nevertheless, the effectiveness of insurance programs varies considerably among countries because of differences in policy design, institutional capacity, premium subsidy mechanisms, farmer participation, and claim settlement procedures.

The reviewed literature generally indicates that countries with well-established agricultural insurance systems tend to experience stronger post-disaster recovery outcomes than countries where insurance coverage remains limited. Government intervention through premium subsidies, digital monitoring systems, and effective institutional coordination may support insurance performance and strengthen farmers' confidence in participating in insurance programs. Conversely, administrative complexity, delayed claim payments, inadequate farmer awareness, and limited insurance accessibility remain the principal barriers reducing program effectiveness.

Hydrometeorological Disaster Risks in Rice Farming

The reviewed studies generally identify hydrometeorological disasters as important threats to rice production worldwide. Floods, droughts, excessive rainfall, tropical storms, and prolonged dry seasons have become more frequent due to climate change, causing severe crop failures and substantial financial losses for farming households. Rice cultivation is particularly vulnerable because production depends heavily on stable rainfall patterns, water availability, and seasonal climatic conditions.



Several studies report that climate variability has increased production uncertainty, making farmers more vulnerable to income instability. Unexpected flooding frequently destroys standing crops before harvest, while prolonged drought reduces irrigation water availability and significantly decreases productivity. In many developing countries, repeated exposure to these disasters forces farmers to sell productive assets, reduce agricultural investment, accumulate debt, or even abandon farming activities altogether. Such conditions substantially weaken household financial resilience and threaten long-term agricultural sustainability.

The literature further indicates that smallholder farmers experience disproportionately greater impacts than commercial producers because they generally possess limited financial reserves, lower access to formal financial services, and inadequate disaster preparedness. Without effective financial protection mechanisms, recovery following climate-related disasters often requires several planting seasons, resulting in persistent income instability and declining household welfare

Performance of National Rice Crop Insurance Schemes

The reviewed literature suggests that national rice crop insurance schemes have become important policy instruments for managing agricultural risks associated with hydrometeorological disasters. Most countries examined in this review—including Indonesia, China, India, Japan, Vietnam, Bangladesh, and the Philippines—have implemented government-supported crop insurance programs to protect farmers from production losses caused by floods, droughts, and other natural hazards.

Government premium subsidies emerge as one of the most important determinants of insurance participation. Studies generally suggest that subsidized insurance premiums may increase farmers' willingness to participate because affordability remains a major concern for smallholder farmers. In several countries, governments subsidize between 60% and 90% of premium costs, thereby reducing farmers' financial burden while expanding insurance coverage.

The review also reveals that efficient claim settlement procedures substantially influence farmer satisfaction and program effectiveness. Countries employing satellite imagery, remote sensing technologies, geographic information systems (GIS), and digital damage assessment generally process insurance claims more rapidly than those relying exclusively on manual field inspections. Faster compensation enables farmers to purchase seeds, fertilizers, and other production inputs for the following planting season, thereby accelerating post-disaster recovery.

Despite these positive outcomes, numerous implementation challenges remain. Several studies identify low insurance literacy, complicated administrative requirements, insufficient



dissemination of program information, and limited institutional coordination as major obstacles to wider participation. Delays in claim verification and compensation payments also reduce farmer confidence, ultimately discouraging continued enrollment in insurance programs.

Farmer Financial Resilience

The reviewed studies consistently demonstrate that participation in rice crop insurance contributes positively to strengthening farmers' financial resilience. Financial resilience refers to farmers' capacity to withstand, absorb, recover from, and adapt to financial shocks resulting from hydrometeorological disasters while maintaining agricultural production and household livelihoods. One of the most significant benefits identified across the literature is income stabilization. Insurance compensation enables farmers to partially recover production losses, thereby reducing the immediate economic consequences of crop failure. Stable income allows farming households to maintain consumption, continue educational expenditures, meet loan repayment obligations, and finance subsequent planting activities without relying heavily on informal borrowing.

Another important finding concerns improved access to agricultural credit. Financial institutions generally perceive insured farmers as lower-risk borrowers because insurance reduces default risks associated with climate-induced production failures. Consequently, insured farmers often experience greater access to production loans, enabling them to invest in improved seeds, fertilizers, irrigation systems, farm machinery, and climate-smart agricultural technologies. These investments subsequently contribute to higher productivity and improved long-term economic resilience.

The literature also indicates that crop insurance encourages farmers to adopt more productive farming practices. Reduced financial uncertainty increases farmers' willingness to invest in higher-quality agricultural inputs and innovative technologies because potential losses are partially covered by insurance protection. As a result, insurance contributes not only to disaster recovery but also to long-term agricultural development and productivity improvement.

Policy Implications for Strengthening National Rice Crop Insurance Schemes

The reviewed literature emphasizes that strengthening national rice crop insurance requires integrated policy approaches extending beyond financial compensation alone. Successful insurance programs combine premium subsidies, efficient institutional governance, farmer education, digital technologies, and climate adaptation strategies within a comprehensive agricultural risk management framework.



Several studies recommend expanding insurance coverage to reach more smallholder farmers, particularly those located in disaster-prone regions. Increasing government investment in premium subsidies remains essential because affordability continues to be a major determinant of farmer participation. Simultaneously, simplifying registration procedures and improving outreach activities can significantly increase insurance enrollment. Digital transformation also emerges as a key strategy for improving program performance. The adoption of satellite monitoring, unmanned aerial vehicles (UAVs), remote sensing, artificial intelligence, and mobile-based insurance platforms can improve damage assessment accuracy, reduce administrative costs, accelerate claim settlement, and increase transparency throughout insurance operations. These technological innovations strengthen institutional efficiency while enhancing farmer confidence in insurance systems.

Furthermore, the reviewed studies recommend integrating crop insurance with broader climate adaptation policies, including early warning systems, climate information services, resilient irrigation infrastructure, climate-smart agriculture, agricultural extension programs, and farmer capacity-building initiatives. Such integration enables insurance programs to function not only as financial protection mechanisms but also as strategic instruments supporting sustainable agricultural development under increasing climate uncertainty. Overall, the findings indicate that national rice crop insurance schemes play a significant role in strengthening farmer financial resilience against hydrometeorological disasters. However, maximizing their effectiveness requires continuous improvements in governance, accessibility, institutional coordination, technological innovation, and policy integration. These measures are essential for ensuring the long-term sustainability of rice production and enhancing food security amid the growing impacts of climate change.

4. Discussion

The findings of this systematic literature review demonstrate that national rice crop insurance schemes constitute one of the most important financial instruments for strengthening farmers' resilience against hydrometeorological disasters. Across the reviewed studies, agricultural insurance consistently reduces the financial consequences of crop failures by providing compensation that enables farmers to recover production losses, maintain household income, and continue farming activities following climate-related disasters. These findings support previous studies arguing that agricultural insurance not only functions as a risk-transfer mechanism but also contributes to long-term agricultural sustainability by reducing farmers' economic vulnerability.

Hydrometeorological disasters have become increasingly unpredictable due to climate change, creating greater uncertainty within agricultural production systems. Floods, droughts,



excessive rainfall, tropical cyclones, and prolonged dry seasons have significantly increased production risks, particularly for smallholder rice farmers whose livelihoods depend almost entirely on seasonal crop production. Unlike commercial agricultural enterprises that generally possess greater financial resources and diversified income sources, smallholder farmers often lack sufficient savings or access to formal financial services to recover from severe production losses. Consequently, repeated climate shocks frequently generate persistent poverty, declining agricultural investment, and reduced rural economic stability. The reviewed literature therefore emphasizes that strengthening farmers' financial resilience has become an essential component of climate adaptation and food security policies.

One of the principal findings concerns the positive contribution of rice crop insurance to household financial stability. Insurance compensation allows farmers to replace lost production capital immediately after disasters, reducing dependence on informal loans or distress sales of productive assets. This finding is consistent with agricultural risk management theory, which suggests that effective insurance mechanisms reduce income volatility and enable households to maintain consumption, continue production activities, and recover more rapidly following adverse events. The reviewed studies also indicate that insured farmers generally experience greater confidence in making agricultural investments because financial risks associated with climate uncertainty are partially transferred to insurance providers.

The review further highlights the importance of government intervention in improving insurance effectiveness. Most successful national rice crop insurance programs operate through substantial government premium subsidies, making insurance affordable for smallholder farmers. Countries such as Japan, China, India, and Indonesia have demonstrated that public financial support significantly increases insurance participation rates while reducing farmers' financial burden. However, subsidy policies alone are insufficient to guarantee program success. Institutional effectiveness, transparency, administrative efficiency, and farmer trust remain equally important determinants influencing insurance participation and long-term sustainability.

Another important finding relates to claim settlement efficiency. Several reviewed studies reveal that delayed compensation payments substantially reduce farmers' confidence in insurance programs. When compensation is received several months after crop failure, farmers often struggle to finance the subsequent planting season, limiting the practical benefits of insurance. Conversely, countries utilizing satellite imagery, remote sensing technology, unmanned aerial vehicles (UAVs), and digital claim verification systems generally achieve faster claim processing and improved administrative efficiency. Digital transformation therefore represents an important strategy for strengthening agricultural insurance governance while reducing operational costs and increasing transparency.



The findings also indicate that financial resilience extends beyond compensation for production losses. Insurance participation improves farmers' access to agricultural credit because financial institutions perceive insured farmers as less risky borrowers. Improved credit access enables farmers to purchase improved seeds, fertilizers, irrigation equipment, machinery, and climate-smart technologies that enhance agricultural productivity. Consequently, crop insurance generates indirect economic benefits by encouraging productive investment and technological adoption, ultimately strengthening long-term agricultural resilience.

Farmer participation emerged as another critical determinant influencing insurance performance. Although many governments provide premium subsidies, participation rates remain relatively low in several developing countries due to limited insurance literacy, inadequate dissemination of information, complicated administrative procedures, and insufficient understanding of insurance benefits. The reviewed studies consistently recommend strengthening agricultural extension services, improving financial education, and involving local farmer organizations in insurance promotion. Increasing farmer awareness not only improves insurance participation but also enhances trust in government-supported agricultural risk management programs.

The review further demonstrates that crop insurance should not be implemented as a standalone policy. Instead, insurance becomes substantially more effective when integrated with broader climate adaptation and disaster risk reduction strategies. Early warning systems, climate information services, resilient irrigation infrastructure, weather forecasting technologies, climate-smart agricultural practices, and disaster preparedness programs complement insurance by reducing production risks before disasters occur. Such integrated approaches improve farmers' adaptive capacity while minimizing both disaster impacts and compensation costs.

From a policy perspective, strengthening national rice crop insurance schemes requires continuous institutional reform and technological innovation. Governments should expand insurance coverage, particularly among vulnerable smallholder farmers located in disaster-prone regions. Simplifying registration procedures, improving claim transparency, expanding digital service platforms, and strengthening collaboration among government agencies, insurance companies, meteorological institutions, and agricultural extension services are essential for improving program effectiveness. Furthermore, adopting advanced technologies such as artificial intelligence, geographic information systems (GIS), satellite monitoring, and remote sensing can significantly improve disaster assessment accuracy and accelerate compensation delivery.



Despite providing comprehensive insights, this study has several limitations. First, the analysis is based exclusively on secondary literature and therefore does not include primary field data or direct interviews with farmers and policymakers. Second, differences in insurance systems, institutional arrangements, and climatic conditions across countries may influence the comparability of empirical findings. Third, this review applies a qualitative synthesis rather than a quantitative meta-analysis, preventing statistical estimation of the magnitude of insurance impacts on financial resilience. Future research is therefore encouraged to integrate systematic literature reviews with econometric analyses, panel data models, impact evaluations, or structural equation modeling to provide stronger empirical evidence regarding the effectiveness of national rice crop insurance schemes.

Overall, the reviewed literature demonstrates that national rice crop insurance schemes play a strategic role in strengthening farmers' financial resilience against hydrometeorological disasters. However, achieving long-term program effectiveness requires integrated improvements in institutional governance, premium subsidy mechanisms, digital innovation, farmer participation, financial inclusion, and climate adaptation policies. These combined efforts will enhance the sustainability of rice farming systems while supporting national food security under increasingly uncertain climatic conditions.

5. Conclusions

This systematic literature review demonstrates that national rice crop insurance schemes play a vital role in strengthening farmers' financial resilience against hydrometeorological disasters. The reviewed studies consistently indicate that crop insurance reduces farmers' financial vulnerability by compensating for production losses, stabilizing household income, supporting post-disaster recovery, and encouraging continued agricultural investment. As climate change increases the frequency and severity of floods, droughts, and other extreme weather events, crop insurance has become an essential component of agricultural risk management and sustainable food production.

The findings further reveal that the effectiveness of national rice crop insurance programs is strongly influenced by several interrelated factors, including government premium subsidies, institutional capacity, claim settlement efficiency, insurance accessibility, farmer participation, and the adoption of digital technologies. Countries with well-developed insurance systems and effective institutional coordination generally achieve better outcomes in terms of farmer participation, compensation delivery, and production recovery. Conversely, limited insurance literacy, administrative complexity, delayed claim payments, and inadequate policy coordination continue to constrain program performance in many developing countries.



From a policy perspective, strengthening national rice crop insurance requires integrated strategies that extend beyond financial compensation alone. Governments should improve insurance governance by expanding premium subsidy programs, simplifying administrative procedures, accelerating claim verification through digital technologies, and increasing insurance coverage among smallholder farmers. In addition, crop insurance should be integrated with broader climate adaptation measures, including early warning systems, climate-smart agricultural practices, resilient irrigation infrastructure, agricultural extension services, and financial inclusion programs. Such integrated approaches will enhance farmers' adaptive capacity while improving the long-term sustainability of national rice production systems.

Future research is recommended to complement qualitative literature synthesis with quantitative analytical approaches, such as impact evaluation, panel data regression, structural equation modeling, and cost-benefit analysis, to measure the effectiveness of crop insurance programs more comprehensively. Comparative cross-country studies and evaluations of emerging digital insurance technologies are also needed to identify best practices that can strengthen agricultural insurance policies under increasing hydrometeorological risks. These efforts are expected to support evidence-based policymaking and contribute to improving farmer welfare, agricultural resilience, and national food security in the face of ongoing climate change.

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