Enhancing Farmers Human Capital and Awareness Digital Agricultural Insurance in Multi-Hazard Prone Area of Temon, Kulon Progo

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Abstract. This study explores strategies for enhancing farmers' human capital and awareness to improve the adoption of digital agricultural insurance in multi-hazard-prone areas of Kulon Progo, Indonesia. As a disaster-prone region frequently impacted by floods, droughts, and pest outbreaks, Kulon Progo's rice farmers face significant risks that threaten crop yields and livelihoods. The government's Rice Farming Insurance Program (Asuransi Usaha Tani Padi - AUTP) offers subsidized financial protection against such risks, but adoption remains limited due to challenges including low awareness, procedural complexity, and digital literacy barriers. Through qualitative research involving key informant interviews, this study identifies critical human capital factors affecting farmers' engagement with digitalized AUTP platforms. Using triangulation method, results indicate that increasing farmers' knowledge, digital skills, and trust in insurance mechanisms is essential to enhance participation. Furthermore, the growing familiarity of farmers with digital technology presents a valuable opportunity to expand the reach and effectiveness of digital agricultural insurance in Kulon Progo. Strengthening educational outreach, simplifying insurance processes, and fostering collaboration between government agencies, insurers, and farmer groups are recommended to build resilience against natural disaster-induced risks. This research underscores the importance of integrating human capital development with technological innovation to support sustainable agriculture and disaster risk management in Indonesia's vulnerable rural communities.

Keywords: *AUTP, digital agricultural insurance, multi-hazard-prone area.*

1 Introduction

Indonesia, located on the Pacific Ring of Fire and characterized by a tropical climate, is highly vulnerable to a wide range of natural hazards—including earthquakes, floods, droughts, and pest outbreaks—that pose significant threats to the agricultural sector. In 2023, recorded over 3,000 disaster events, with approximately 40% classified as hydrometeorological disasters that directly impacted agricultural land (BNPB, 2024).

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Over the past two decades, disaster-related agricultural losses in Indonesia have exceeded USD 10 billion (FAO, 2023). Projections based on climate models forecast a decrease of up to 1.5 °C in dry season rainfall and increased precipitation variability in Java, potentially reducing rice yields by as much as 30% by 2050 (FAO, 2022; Samir et al., 2024). These environmental stressors are compounded by declining pollinator populations and shrinking arable land, thereby heightening the urgency for comprehensive adaptation strategies to safeguard farmer resilience and national food security (Samir et al., 2024; AMICAF, 2023).

As part of its disaster risk reduction strategy in agriculture, the Indonesian government introduced the AUTP. Enacted under Law No. 19 of 2013 and further regulated by Presidential Regulation No. 98 of 2014 and Ministry of Agriculture Regulations No. 40/Permentan/SR.230/7/2015 and No. 18 of 2018, AUTP aims to provide income protection for farmers in the event of crop failure. The program is designed to support the sustainability of farming activities, reduce the fiscal burden on the state from agricultural disasters, and enhance farmer self-reliance in managing production risks. Empirical evidence indicates that farmers' responses to the AUTP program have varied across regions. In Malang, farmers expressed negative perceptions of the program, citing limited benefits and procedural complexities (Siregar, 2017). Similarly, in Kebumen, a majority of farmers chose not to participate, perceiving the program as ineffective (Khasanah et al., 2020). In Tabanan, while farmers acknowledged that claim payments were helpful in continuing farming activities, many questioned the program's overall effectiveness in mitigating crop failure risks (Dewi et al., 2020).

Notably, recent observations suggest a shift in farmer attitudes. Field reports from 2024 indicate a more favorable reception of AUTP in certain regions, attributed to improvements in outreach, claim processing, and stakeholder engagement. This evolution suggests incremental enhancements in the program's implementation and perceived utility. Against this backdrop, agricultural insurance has gained prominence as a strategic instrument for mitigating disaster-related risks faced by farmers. More recently, the integration of digital technologies into insurance delivery systems has emerged as a promising innovation. Digital agricultural insurance—leveraging mobile platforms and online services—offers the potential to increase efficiency, transparency, and accessibility for smallholder farmers (World Bank, 2021).

Although digital tools have great potential, their use is still limited in remote and disaster-prone areas due to low awareness, poor digital skills, and weak support systems. However, recent progress in Indonesia's digital ecosystem is helping change this. Since the early 2000s, internet use has grown steadily, with 10% of the population online by 2005. Mobile phone use also increased sharply, from under 5% in 2005 to over 60% by 2015, thanks to smartphones. Government programs like the Palapa Ring project and the National Digital Literacy Movement have helped expand access, especially in rural areas. By 2022, Indonesia had over 200 million internet users, making it one of Southeast Asia's largest digital economies. These changes have improved how people communicate, do business, and access public services across the country.

Two major national programs have played pivotal roles in shaping digital and financial behaviors in rural communities: QRIS (Quick Response Code Indonesian Standard) and BPJS Kesehatan (National Health Insurance Scheme). Launched in 2019,

QRIS enabled over 32 million businesses—92% of which are micro-enterprises—to accept digital payments, facilitating more than 2.6 billion transactions per quarter and reaching an annual transaction value of 42 trillion rupiah (Bank Indonesia, 2023). In rural settings, QRIS adoption has reduced cash dependence, improved transaction efficiency, and increased household income by an average of 12% (Rahman & Mulyani, 2023). Likewise, BPJS Kesehatan digitalization program, implemented in 2014, now covers more than 250 million citizens—representing 91% of the population—and has expanded access to affordable healthcare through a nationwide network of over 10,000 facilities (BPJS Kesehatan, 2023). Its influence has included improved health-seeking behavior and strengthened financial protection, particularly in rural and low-income households (World Bank, 2020). Together, these programs have contributed to increasing digital literacy, financial inclusion, and social resilience across rural Indonesia.

This study investigates rural community responses to the implementation of digital agricultural insurance in disaster-prone regions of Indonesia. Specifically, it aims to explore the influence of rising digital literacy and exposure to national digital initiatives—such as QRIS and BPJS Kesehatan—on rural readiness to adopt digital agricultural insurance schemes. Central to this inquiry is an examination of human capital factors that influence awareness, trust, and adoption of agricultural risk protection tools in the digital era.

2 Methodology

This study adopts a mixed-methods approach, combining descriptive statistical analysis and qualitative inquiry. Descriptive statistics are used to present commonly applied human capital indicators, particularly in the fields of education, health, and employment. In addition, disaster-related data collection was conducted in Temon Subdistrict, Kulon Progo Regency, to assess the area's vulnerability to natural hazards—especially those affecting the agricultural sector. Given that agriculture is a primary source of income and employment in this region, understanding disaster risk is essential for protecting rural livelihoods.

In this context, the introduction of digital agricultural insurance is increasingly relevant as a tool to enhance resilience. Through digital platforms, farmers can access weather-indexed insurance schemes that offer faster claims processing and broader coverage, thereby reducing financial losses from climate-related events (World Bank, 2021). This integration of technology and risk management strengthens the resilience of farming communities and contributes to the development of human capital in vulnerable rural areas.

This research employs a qualitative case study design. The study is conducted in Kulon Progo Regency, Yogyakarta Special Region—an agricultural area highly exposed to multiple hazards, including floods and droughts (Department of Agriculture Kulon Progo, 2020). The region is selected due to its high reliance on rice farming and its vulnerability to climate-related disasters, making it a pertinent case for examining awareness and participation in agricultural insurance programs, particularly in their dig-

italized form. Qualitative data were collected through in-depth, semi-structured interviews with purposively selected key informants. Informants were chosen based on their expertise and involvement with the AUTP (Rice Farmer Business Insurance) program. They included local government officials from Temon Subdistrict, agricultural extension officers, and selected farmers with experience or knowledge of AUTP.

The interviews were designed to gather data on: Knowledge and perceptions of the AUTP program; Barriers to enrollment and challenges in human capital development; Effectiveness of current awareness-raising and capacity-building initiatives; Recommendations for improving farmer education and insurance uptake. All interviews were recorded with the participants' permission and later transcribed word-for-word for analysis (Creswell & Poth, 2018).

Thematic analysis was used to identify recurring themes related to human capital and participation in agricultural insurance programs (Braun & Clarke, 2006). This method has six steps: learning the data, making codes, finding and checking themes, naming them, and writing the report. The data were coded by hand to help organize and understand it (Nowell et al., 2017). Thematic analysis is particularly appropriate for exploring complex social phenomena, such as human capital development and awareness in the context of agricultural insurance.

To enhance validity and reliability, triangulation was applied across different key informants and stakeholder groups—such as government officials, farmers, and insurance providers—to cross-verify information and strengthen the credibility of findings (Patton, 2019). We checked our findings with participants to make sure they were correct (Shenton, 2004). We got approval before starting, and everyone agreed to join. We kept all information private and followed ethics rules (American Psychological Association, 2020).

3 Results and Discussion

3.1 Multi-Hazard-Prone Areas Of Temon, Kulon Progo

Temon Subdistrict covers 3,629.09 hectares (6.19% of the total land area of Kulon Progo Regency). It is one of 12 subdistricts in the regency and is located in the Special Region of Yogyakarta, between approximately 7° 91' 67" South Latitude and 110° 15' 00" East Longitude. Administratively, Temon is divided into 15 villages, the highest number of villages among all subdistricts in Kulon Progo. Within Temon, there are 95 hamlets, 166 neighborhood associations (RW), and 401 community units (RT). The size of each village varies, with the largest being Glagah Village (6.04 km²) and the smallest Karangwuluh Village (1.30 km²). Other village areas include Jangkaran (3.66 km²), Sindutan (2.98 km²), Palihan (3.59 km²), Kalidengen (1.51 km²), Plumbon (2.97 km²), Temon Wetan (2.23 km²), Temon Kulon (1.56 km²), Kebonrejo (1.72 km²), and Janten (1.33 km²). According to data from the Population and Civil Registration Service of Kulon Progo Regency, the population of Temon in the first half of 2023 was 29,442, consisting of 14,566 males and 14,876 females with the sex ratio was 97.92. The aver-

age population density in Temon Subdistrict in 2023 was 811 people per square kilometer. Population density varies across the 15 villages, with Kedundang Village having the highest density (1,820 people/km²) and Glagah Village the lowest (491 people/km²).

Temon District in Kulon Progo Regency, Yogyakarta, is highly susceptible to hydrometeorological disasters, notably floods, which are aggravated by climate change-induced rainfall variability. The operation of the Yogyakarta International Airport (YIA) within Temon has amplified flood risks, particularly during rainy seasons, due to overflow from drainage systems, surface runoff, heavy sedimentation, and impacts from the Serang watershed system (Ulumuddin et al., 2023; Fadilah et al., 2023). Mitigation efforts such as drainage normalization and embankment construction have been implemented, yet sustainable measures like retention ponds are deemed necessary to manage floods effectively (Nurdianto, 2024). Hydrological modeling using SHETRAN in the Progo watershed identified major inundation events, including a recorded flood extent of 3,856 m in 2010 (Suroso et al., 2020). In coastal Temon, risks include potential tsunami inundation reaching up to 19.9 m due to proximity to the Java–Sumatra megathrust: adaptive infrastructural designs, like elevated terminal floors at YIA, account for tsunami resilience up to 12 m (Darmawan et al., 2025; Hakim, 2024). Spatial vulnerability mapping shows that central and northern villages—such as Palihan, Kebonrejo, Temon Kulon, Kaligintung, parts of Plumbon, and Kalidengen—are classified as low flood risk, likely due to their elevated terrain and stable soil conditions. In contrast, localized medium-risk zones (e.g. Sindutan, Kulur, parts of Jangkaran) are affected by poor drainage or proximity to minor river flows. The most acute hazard exists in southern coastal areas—most of Temon Village, Jangkaran, and parts of Karangwuluh—which are low-lying, flat regions highly vulnerable to tidal flooding and inadequate stormwater discharge.

Drought remains another prominent hazard in Temon, amplified by climate change and exacerbated by groundwater depletion and land-use changes. Rainfall shifts linked to global warming have increased drought severity (Ikhsan et al., 2024). Although Temon is categorized as low risk for drought annually, it continues to face challenges during dry months, necessitating improved drought risk management strategies (Ikhsan et al., 2024). Groundwater sources have declined dramatically—averaging a loss of approximately 1.62 million m³ annually—due to rapid land conversion (Novianto & Sejati, 2023; Wati et al., 2024). Demand from infrastructure expansion such as YIA further strains supplies, exacerbating water scarcity during dry periods. Drought risk mapping across Kulon Progo indicates daily drought disasters remain low in Temon District, but higher in regions such as Girimulyo which fall under medium risk (Ikhsan et al., 2024). To bolster resilience, interventions such as rainwater harvesting, sustainable irrigation, climate-smart agriculture, and early warning systems have been recommended (Yang et al., 2023; Ardana et al., 2025).

Economic and social losses inflicted by floods and droughts in Temon are considerable, particularly affecting agricultural livelihoods. In Central Java, flood vulnerability correlates strongly with socioeconomic indicators like income and education (Sigit et al., 2023), and landscape conversion has intensified disaster recurrence, resulting in crop, livestock, and infrastructure loss—similar to observations from other regions (Shibeshi et al., 2022). A 2013 flood event in Kulon Progo caused over Rp 3.4 billion

in agricultural damage across 104 ha of paddy fields, including locations within Temon (ANTARA News, 2013). Water scarcity linked to drought has undermined productivity and access to domestic water. The cumulative impact extends beyond economics, affecting social well-being and community stability (Schie et al., 2024). Additionally, land-use alterations due to YIA have further increased resource demands and intensified environmental stresses (Mustofa, 2023).

Based on field assessments conducted in this study, addressing the complex disaster vulnerabilities in Temon requires a comprehensive and integrated set of mitigation strategies. These include strengthening education and outreach programs for farmers to improve awareness of disaster risk reduction and promote climate-adaptive agricultural practices. The adoption of climate-smart agriculture is also essential, particularly the use of water-efficient irrigation technologies and drought-tolerant crop varieties. Furthermore, implementing agricultural insurance schemes such as the AUTP, along with improving digital access and awareness among farmers, can help minimize financial losses due to crop failure or livestock damage. Lastly, infrastructure development—specifically the improvement of irrigation networks and post-harvest storage facilities—is crucial to enhance the community's resilience to both flood and drought hazards.

3.2 Human Capital in Temon, Kulon Progo

The government continues to improve education by providing better facilities, developing human resources from an early age, and ensuring nine years of basic education. Data from the education sector are used to measure program success, track human development, and guide policy planning and evaluation. UNESCO recommends a pupil-to-teacher ratio (PTR) of 20:1 to 30:1 for primary schools and 15:1 to 25:1 for secondary schools (UNESCO, 2015; OECD, 2021).

Table 1. Summary of Schools, Enrollment, and PTR by Level and Type in Kulon Progo.

Level of school	Status	No. of schools	Pupils	Teacher	PTR	UNESCO	OECD
Elementary	Public	21	2073	200	1:10	Ideal	Ideal
Elementary	Private	6	609	62	1:10	Ideal	Ideal
Junior high	Public	3	1151	73	1:16	Ideal	Ideal
Junior high	Private	3	310	27	1:11	Ideal	Ideal
Senior high	Public	1	409	34	1:12	Ideal	Ideal

The educational landscape in Sub-district of Temon reflects the successful implementation of government programs aimed at improving human capital through infrastructure development, early childhood quality enhancement, and the enforcement of 9 years of compulsory basic education. The data show that the pupil-to-teacher ratios (PTR) across all levels of schooling—public and private—are not only within but surpass the ideal standards recommended by UNESCO and the OECD. With PTRs ranging from 1:10 to 1:16, far below the global benchmarks, the education system in this region

demonstrates strong institutional capacity to deliver effective and equitable learning environments. These favorable conditions serve as a key indicator of the government's educational success and provide a solid foundation for long-term improvements in human development. Moreover, this data can function as an essential tool for policy planning, monitoring, and evaluation, helping stakeholders ensure that future investments continue to promote inclusive and high-quality education.

The Gini coefficient of Kulon Progo Regency in 2023 was recorded at 0.402, which is an increase from 0.380 in 2022. This rise indicates that income inequality in Kulon Progo has grown. The increase is influenced by the influx of investment and infrastructure development in the region, which has likely benefited certain groups more than others. While these developments contribute positively to the area's growth, they have also widened the economic gap among the population in 2023.

The Human Development Index (HDI) of Kulon Progo Regency in 2023 was recorded at 75.12, showing a slight increase from 75.08 the previous year. Meanwhile, in 2024, the HDI of Kulon Progo Regency further rose to 76.18. A higher HDI value indicates improvements in these aspects, meaning that the quality of life of the people in Kulon Progo has been gradually improving year by year. Although the increase from 2022 to 2023 was small, it reflects positive progress. The more significant increase in 2024 demonstrates better human development progress in the region. In summary, these data show that the well-being and quality of life of the Kulon Progo community have been steadily improving from 2022 through 2024.

Sub-district of Temon demonstrates favorable conditions for human capital formation, as evidenced by strong educational infrastructure and ideal pupil-to-teacher ratios that align with international standards. These strengths suggest a supportive environment for skill development and learning. However, the increasing Gini coefficient at the regency level indicates growing economic disparities, which may hinder equal access to opportunities and limit the inclusive impact of human capital improvements. Despite this, the consistent rise in the Human Development Index (HDI) reflects overall progress in health, education, and living standards, partially offsetting concerns about inequality. In conclusion, while positive trends in education and human development are evident, addressing income inequality remains essential to ensure that the benefits of enhanced human capital are equitably distributed across all segments of the population in both Temon and the broader Kulon Progo Regency.

Based on the available data and interpretation, it cannot be explicitly concluded that the human capital in Sub-district of Temon is fully ready to adopt digital technology. However, several indicators suggest a promising potential for digital technology introduction. The education sector shows well-established infrastructure and favorable pupil-to-teacher ratios that meet UNESCO and OECD standards, indicating a solid educational foundation critical for developing the skills necessary to utilize digital technologies (UNESCO, 2015; OECD, 2021). Furthermore, the gradual increase in the Human Development Index (HDI) from 75.08 in 2022 to 76.18 in 2024 reflects an overall improvement in health, education, and living standards, which are key factors supporting human capacity to learn and adapt to technological advancements (UNDP, 2023). Nevertheless, the rising Gini coefficient—from 0.380 to 0.402 between 2022 and 2023—signals growing income inequality in the region, potentially limiting equitable access to digital devices and training, thereby affecting the inclusivity of technology adoption (World Bank, 2020). To firmly establish the readiness of human capital in Kecamatan

Temon for digital technology adoption, further research is needed focusing on digital literacy levels, access to digital infrastructure, and the availability of relevant training programs.

Sub-district of Temon demonstrates strong potential for human capital development, especially through its well-established education sector, which features ideal pupil-to-teacher ratios surpassing UNESCO and OECD benchmarks. This reflects the successful implementation of government programs aimed at improving education infrastructure and access. Furthermore, the steady rise in the Human Development Index (HDI) from 2022 to 2024 indicates gradual improvements in overall well-being, particularly in education, health, and living standards. However, the rising Gini coefficient highlights increasing income inequality in the broader Kulon Progo Regency, which poses a challenge to inclusive development. While the educational foundation in Temon suggests promising potential for adopting digital technologies, the growing inequality may hinder equitable access to these advancements. Therefore, although the human capital in Temon is progressing, further assessment is necessary—particularly regarding digital literacy, access to digital infrastructure, and the availability of technology-related training—to determine its full readiness for digital transformation.

3.3 Farmers' Readiness To Use Digital Insurance

Given sub-district of Temon's high vulnerability to multiple natural hazards, agricultural insurance serves a crucial function in safeguarding farmers from crop losses caused by natural disasters or pest infestations. However, despite its significance, the adoption rate of AUTP remains low in several areas, including Temon Sub-district. Interestingly, despite generally low educational attainment among farmers, the human capital in Temon Sub-district demonstrates a growing readiness for digital transformation. This is evidenced by the high participation rate in the national health insurance program (BPJS), suggesting an improvement in digital literacy among the local population. To assess the readiness of farmers in embracing digital agricultural services, This qualitative study involved interviews with four leaders of farmer groups (kelompok tani) in Temon sub-district.

Qualitative data extracted from interviewed with respondent i.e. R1 (58 years old), R2 (48 years old), R3 (56 years old), R4 (55 years old). Summary interpretation for qualitative data in this case reflects a disconnect between program design and ground-level realities, where gaps in outreach, digital literacy, and trust in institutional processes serve as primary barriers to farmer participation in AUTP. However, it also indicates that targeted support and localized education—such as personal guidance from farmer groups or village youth—could significantly improve uptake. These insights emphasize the importance of accessible communication, trust-building, and human-centered implementation strategies in rural insurance programs.

1. Awareness of AUTP and Digital Platform

A recurring theme across the interviews is the limited awareness among farmers about the AUTP and particularly its digital registration mechanism. Many farmers expressed that they had either never heard of the program or had only encountered vague information about it through informal conversations with peers. For instance, Pak R1 emphasized the lack of direct outreach, stating, *"No one has ever come directly to our*

hamlet to explain it." This sentiment was echoed by Pak Nawawi, who noted, *"There hasn't been any detailed explanation for us farmers."* These responses highlight a significant gap in formal communication and socialization efforts by agricultural authorities. Even among those who were somewhat familiar with AUTP, there was a widespread lack of clarity regarding the registration process and the potential benefits of the program. This gap not only contributes to low participation rates but also fosters skepticism and confusion about the program's value and functionality.

2. Access and Barriers to Participation

Farmer participation in the AUTP program is significantly obstructed by a combination of structural and personal barriers. These include low levels of digital literacy, complex and unclear claim procedures, and ineffective communication from agricultural field officers. For example, R2, who only completed elementary school, admitted, *"I don't really know how to use a smartphone for stuff like that,"* illustrating how educational background limits access to digital systems. Similarly, R3 described his hesitation to join the program due to confusing requirements, saying, *"The process was complicated and had a lot of unclear requirements."* These experiences suggest that while digital registration is available, manual methods remain the default, as many farmers lack the skills or support needed to navigate digital platforms. The absence of clear guidance and hands-on assistance exacerbates the issue, preventing many farmers from fully understanding or trusting the system. As a result, technical and procedural complexities—combined with limited capacity—contribute to low uptake and participation in AUTP.

3. Trust and Perceptions of Program Effectiveness

A significant factor contributing to low farmer participation in AUTP is mistrust stemming from past negative experiences and insufficient clarity about the claim process. Farmers often share stories of peers whose claims were rejected, creating skepticism and reluctance toward the program. For instance, R3 recounted that a friend's claim *"wasn't approved,"* and added, *"we're confused about whom to report to,"* highlighting the lack of structured communication and clear guidance. Many farmers are discouraged by delays in claim processing, as well as unclear requirements regarding documentation and thresholds for crop loss. These issues not only frustrate farmers but also undermine confidence in the system, especially when claims are rejected due to technicalities. Without transparent procedures and reliable support, trust in AUTP remains fragile, ultimately deterring wider participation and reducing the program's perceived credibility in farming communities.

4. Role of Education in Program Uptake

The level of formal education among farmers plays a critical role in shaping their ability and willingness to engage with digital platforms, particularly for programs like AUTP. Farmers who have completed junior or senior high school are notably more likely to understand and utilize the digital registration systems. This correlation arises because higher educational attainment enhances digital literacy, administrative confidence, and awareness of financial tools such as insurance. For example, R4 noted, *"I only went to primary school, so I'm not very good with apps,"* which reflects the limitations faced by less-educated farmers in adopting digital solutions. Educated farmers are more comfortable navigating smartphones, filling out online forms, and understanding the concept of risk-sharing through insurance. Consequently, education serves as an enabler,

promoting the convergence of traditional and modern agricultural paradigms and advance digital infrastructure, while its absence contributes to digital exclusion and lower program uptake.

5. Role of Intergenerational Support

In many rural households, younger family members play a pivotal role in enabling older farmers to engage with digital platforms such as those used for AUTP registration. This informal intergenerational support system helps bridge the gap between limited digital literacy and the growing reliance on online tools for government services. R4 shared, *"I've used my phone... but usually, I ask my son or grandson to help,"* highlighting a common scenario where older, less-educated farmers depend on younger relatives to navigate smartphones and applications. This assistance is often the deciding factor that allows farmers to access services they would otherwise avoid due to complexity or lack of understanding. While not a formal solution, this reliance on family support underscores the importance of community and household dynamics in rural digital adoption and suggests the potential of family-inclusive training or community-based digital facilitators to expand access equitably.

6. Perceived Relevance of Insurance

Farmers exhibit diverse perspectives regarding the value of crop insurance, with responses ranging from indifference to cautious interest. A significant portion of farmers, particularly older individuals with long farming experience, view crop failure as a normal, unavoidable risk rather than something that can be mitigated through formal protection mechanisms. As R1 expressed, *"I've always thought that crop failure is just part of farming."* This mindset reflects a deep-rooted acceptance of agricultural risk as an inherent aspect of the livelihood. Conversely, other farmers recognize the potential benefits of AUTP, particularly in safeguarding their income and ensuring stability in the face of disasters. However, this group is often discouraged by unclear processes, insufficient information, and past negative experiences with claim rejections or delays. These mixed feelings suggest that while there is an underlying openness to insurance, effective implementation and communication are essential to shift perceptions and build trust in the program's reliability and value.

7. Preferred Support and Suggestions for Improvement

Across interviews, many farmers expressed a clear and consistent demand for better outreach, simpler systems, and practical support to facilitate their participation in the AUTP. A key request was for clearer, more direct explanations of how the program works—particularly the registration and claims processes. Farmers favored regular village-level socialization sessions, ideally facilitated by trusted local figures such as agricultural extension officers or group leaders. There was also a strong preference for offline or hybrid registration methods, recognizing that full digital transformation risks excluding older or less digitally literate farmers. Additionally, training on how to use digital tools—delivered through accessible, hands-on sessions—was seen as a necessary step toward equitable participation. As R4 shared, *"If someone explains things slowly, we can follow. The will is there—we just need a bit of guidance."* This sentiment reflects both the openness among farmers to adopt new systems and the urgent need for program designs that match the local realities of education, age, and technological access in rural farming communities.

Table 2. Narrative Analysis Matrix: Farmers' Engagement with AUTP

Theme	Narrative summary (voices from the field)	Intrepretation	Implication for policy/practice
Awareness and information gaps	Farmers like R1 and R2 had only heard about AUTP vaguely, mostly from peers. They lacked direct outreach from agricultural officers.	Many farmers rely on passive, peer-to-peer communication. There is a vacuum of structured and clear socialization from official channels.	Increase targeted, consistent outreach through field agents and farmer group meetings using accessible language and formats.
Digital literacy & accessibility	Farmers such as R3 and R4 struggle with digital platforms due to low education levels but are willing to learn if assisted by younger relatives.	Digital systems create access barriers for older, less-educated farmers. However, intergenerational support enables partial inclusion.	Introduce hybrid (digital & manual) systems and train local youth as digital facilitators to bridge the gap.
Role of education	Farmers with junior/senior high school education are more likely to use digital platforms and understand AUTP benefits.	Formal education enhances digital literacy, administrative confidence, and risk awareness.	Integrate digital and insurance education in farming training programs. Prioritize inclusive strategies for those with low literacy.
Trust and Claim Experiences	Negative past experiences with claims (delays, unclear rejections) make farmers like R3 skeptical of the program.	Poor implementation of claims leads to mistrust, even among initially interested farmers.	Improve transparency, simplify claim requirements, and ensure timely, fair settlements to build credibility.
Cultural Beliefs and Fatalism	R1 believed crop loss is “just part of farming,” reflecting a long-standing culture of risk acceptance.	Fatalism discourages farmers from seeking external risk-sharing mechanisms like insurance.	Use culturally sensitive messaging and testimonials from satisfied participants to shift mindsets.
Support from Family & Community	Farmers rely on younger family members for digital	Intergenerational dynamics are key enablers of digital	Develop family-inclusive training and incentivize youth

	navigation (e.g., BPJS, electricity token), showing openness when supported.	participation in rural households.	engagement in agricultural technology.
Preference for Manual Systems	Most farmers are familiar with manual AUTP registration and prefer assistance from trusted group leaders or agents.	Trust in interpersonal systems remains strong, while digital systems feel distant or unreliable.	Maintain and strengthen offline registration while slowly scaling up digital capacity through trust-based intermediaries.

Farmers often don't understand the AUTP program well because there hasn't been enough clear outreach. To improve this, regular and local information sessions should be held. Many farmers struggle with using digital tools, especially those with less education, so offering offline ways to register and involving family members can really help. Trust is low because of past issues and unclear processes, so making the claims process faster and easier to understand is important. Field officers and younger family members play a big role in helping farmers use digital platforms, so training young people to support them is a good idea. Farmers also want simple, local training that community facilitators can provide. Overall, farmers are open to joining if the process is straightforward and trustworthy, so offering both online and offline options during the shift to digital registration will make the transition smoother.

Table 3. Key Insights and Recommendation for digitalization AUTP.

Theme	Key insight	Recommendation
Awareness	Poor outreach limits program understanding and uptake.	Localized, consistent socialization campaigns.
Digital literacy	Strongly correlated with education level; a major barrier to participation.	Offline registration mechanisms for inclusivity. Family-inclusive engagement models.
Trust	Negative past experiences and opaque processes reduce farmer confidence.	Clearer and faster claim procedures.
Support system	Field officers and younger family members are essential digital enablers.	Digital literacy training through youth collaboration.
Training needs	High demand for accessible, local training and explanations.	Appointment of community-based digital facilitators.
Participation motivation	Farmers are open to joining if procedures are simplified and trustworthy.	Hybrid system for transitioning into digital platforms.

4 Results and Discussion

The study shows that Temon Subdistrict in Kulon Progo has strong human capital, good educational facilities, and an improving Human Development Index, making it ready for digital transformation such as digital agricultural insurance (AUTP). However, rising income inequality and low digital literacy—especially among older farmers—limit equal access to digital tools. While many farmers are open to new technologies, adoption of AUTP remains low due to unclear procedures, limited outreach, and low trust in institutions. Farmers still prefer manual systems but show interest in simpler processes, local training, and community-based support. To improve participation, the study recommends hybrid registration systems, awareness campaigns, and involving local youth as digital facilitators. Overall, Temon has strong potential for digital adoption, but inclusive, locally adapted strategies are essential for long-term success.

Future research should focus on assessing the levels of digital literacy and access to infrastructure among farmers in Temon to better understand their readiness for digital agricultural insurance. Additionally, studies should evaluate the effectiveness of outreach and training programs, particularly those involving youth and community facilitators, in increasing awareness and participation. Exploring gender and intergenerational dynamics could offer deeper insights into inclusion, while comparative research across other rural, disaster-prone areas would help determine the scalability of such initiatives. Finally, long-term studies are needed to measure the economic and social impacts of digital insurance on farmer resilience and livelihood stability.

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References

AMICAF. (2023). *Assessing the impact of climate change on agriculture in Indonesia: Final report*. FAO–BMKG Collaboration.

APJII (Asosiasi Penyelenggara Jasa Internet Indonesia). (2020). *Indonesia internet user survey report 2020*.

Bank Indonesia. (2023). *QRIS usage statistics*. https://www.bi.go.id

BPJS Kesehatan. (2023). *Annual report and membership coverage*. https://www.bpjs-kesehatan.go.id

BNPB. (2024). *Data bencana Indonesia 2023*. Badan Nasional Penanggulangan Bencana. https://bnpb.go.id

Directorate General of Agricultural Infrastructure and Facilities. (2023). *Guidelines for the implementation of rice farming insurance (AUTP)*. Ministry of Agriculture, Republic of Indonesia.

FAO. (2022). *Digital agriculture and financial services in Asia: Regional assessment*. Food and Agriculture Organization of the United Nations.

FAO. (2023). *The impact of disasters on agriculture and food security 2023*. Food and Agriculture Organization of the United Nations.

Google & Temasek. (2022). *e-Conomy SEA 2022 report*.

Kominfo (Ministry of Communication and Information Technology Indonesia). (2019). *National digital literacy movement*.

McClave, J. T., Benson, P. G., & Sincich, T. (2018). *Statistics for business and economics* (13th ed.). Pearson.

Ministry of Agriculture. (2020). *Annual report on rice farming insurance program (AUTP)*. Jakarta: Ministry of Agriculture RI.

Ministry of Agriculture. (2021). *Livestock insurance program (AUTS) annual report*. Jakarta: Ministry of Agriculture RI.

OECD. (2021). *Education at a glance 2021: OECD indicators*. OECD Publishing. https://doi.org/10.1787/69096873-en

Rahman, H., & Mulyani, R. (2023). The impact of QRIS adoption in rural MSMEs. *Jurnal MyC, JP FEB Unsoed*.

Rumiati Khasanah, Suwarto, & Arip Wijianto. (2020). Respons petani terhadap program asuransi usaha tani padi (AUTP) di Kecamatan Adimulyo Kabupaten Kebumen. *Agritexts: Journal of Agricultural Extension, 44*(1), 41–48. https://doi.org/10.20961/agritexts.v44i1.41881

Samir, S., Nugraha, R. N. P., Utami, R., et al. (2024). Assessing the impact of climate change on agriculture in Indonesia: An ARDL ECM analysis. *Jurnal Ekonomi Kuantitatif Terapan, 18*(1), 19–37.

Siregar, J. (2017). *Persepsi dan respon petani terhadap pelaksanaan program asuransi usahatani padi di Kelurahan Sedayu Kecamatan Turen Kabupaten Malang* (Undergraduate thesis, Universitas Brawijaya).

Dewi, L. W. L., & Suamba, I. K. (2020). Manfaat asuransi usahatani padi dalam menanggulangi risiko usahatani krama subak di Kecamatan Penebel Kabupaten Tabanan. *Jurnal Agribisnis dan Agrowisata (Journal of Agribusiness and Agritourism)*, (July), 221–231. https://ojs.unud.ac.id/index.php/jaa/article/view/62459

World Bank. (2016). *Indonesia digital economy report*.

World Bank. (2020). *Digital Indonesia: Connectivity and inclusion*.

World Bank. (2020). *Indonesia health financing system assessment*.

World Bank. (2021). *Enhancing agricultural insurance in Indonesia: Lessons from international experience and recommendations*. Washington, DC: World Bank Group.

UNESCO. (2015). *Education for all 2000-2015: Achievements and challenges*. UNESCO Publishing. https://unesdoc.unesco.org/ark:/48223/pf0000232205