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Communicating Against Crisis: Farmer Group Strategies for Managing Rat Infestation in Yogyakarta's Rice Fields

Ibnu Hibban[1], Choirul Fajri[2]

[1,2] Department of Communication Science, Faculty of Literature, Culture and Communication, Universitas Ahmad Dahlan, Yogyakarta, Indonesia. Email: ibnu2100030096@webmail.uad.ac.id[1], choirul.fajri@comm.uad.ac.id[2]

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ABSTRACT
This study investigates the interpersonal communication strategies employed by farmer groups in Gemblangan Village, Bantul Regency, Yogyakarta Special Region, to mitigate the severe impact of rat pest (Rattus argentiventer) infestations on rice production. The research aims to answer the following questions: (1) How do farmer groups design and apply interpersonal communication strategies to address rat infestations? (2) What are the outcomes of these strategies for agricultural resilience and social solidarity? Employing a qualitative case study approach, data were collected through in-depth interviews, participant observation, and document analysis. The findings reveal that the farmer group uses a combination of interpersonal communication practices, including monthly deliberative meetings, group-based WhatsApp communication, and informal interactions in the field. These methods foster participatory dialogue, cultural sensitivity, and mutual understanding among members. The effectiveness of these strategies is demonstrated in reduced crop losses, improved participation in collective pest control, and strengthened social cohesion. This study highlights the limitations of its geographic scope and sample size, which may affect generalizability; however, it contributes to the growing body of literature on agricultural communication by demonstrating how localized interpersonal communication integrates traditional practices with digital tools. Implications extend to communication policies, rural leadership training, and sustainable pest management practices.

Keywords: Interpersonal Communication, Communication Strategy, Farmer Group, Rat Pest Management, Rice Productivity.

I. Introduction

Interpersonal communication in agricultural communities can be defined as the process of exchanging information, ideas, and emotions directly among individuals or small groups of farmers in the context of managing farming challenges. Unlike general definitions that highlight interpersonal communication as a universal social skill (Solomon et al., 2021), in agriculture, it refers specifically to the coordination, collaboration, and emotional support that farmers employ to address collective problems such as pest infestations. It encompasses speaking, listening, perception, body language, social context, and increasingly digital communication platforms, adapted to agricultural practices. Communication is not merely instrumental but also cultural and relational. In the farming context, interpersonal communication allows

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farmers to share not only technical knowledge but also moral support and cultural values embedded in local traditions. The use of local languages, proverbs, and expressions strengthens solidarity and trust, which are crucial in contexts where resources are limited and collective action is required. This study situates interpersonal communication as both a social mechanism and a cultural practice that sustains farmer resilience (Saridewi & Annisa, 2025).

The significance of communication in agriculture lies in its role in building trust, solidarity, and collective identity within farmer groups (Mulyasara, 2025). The Kelompok Tani (Farmer Group) of Gemblangan Village, Bantul Regency, Yogyakarta, is a prime example of how interpersonal communication enables farmers to exchange experiences, design strategies, and coordinate collective action. This group serves as a platform for participatory dialogue, enabling farmers to enhance agricultural yields and strengthen their resilience against challenges such as climate change, crop diseases, and pest infestations (Sulaiman et al., 2024). Moreover, the farmer group is embedded in a wider sociopolitical structure, where interpersonal trust among members intersects with their relationships to agricultural extension officers and local government. One of the most pressing agricultural challenges in the region is the infestation of rice field rats (Rattus argentiventer), which are endemic pests known for their adaptability and destructive nature. In 2024, Gemblangan Village experienced significant crop losses due to rat infestations, threatening food security and farmer livelihoods (Brotodjojo et al., 2023). Addressing this crisis requires not only technical pest control but also communication strategies that foster collaboration and participation. In this context, interpersonal communication is not merely the exchange of messages but a social mechanism for collective decision-making and problem-solving. In particular, interpersonal communication creates the basis for organizing mass participation in pest eradication campaigns, motivating reluctant members, and bridging generational differences among farmers.

Previous studies have demonstrated that participatory communication and interpersonal interaction are crucial for the adoption of innovations in agricultural extension (Gailhard et al., 2015; Li et al., 2024). However, there is still limited understanding of how such communication is mobilized in pest management contexts, particularly in Indonesia. Rat infestations represent not only an agronomic problem but also a communicative challenge: how to mobilize collective action in rural settings where farmers have varying capacities, motivations, and access to information. This research contributes to filling that gap by analyzing how farmer groups in Yogyakarta apply interpersonal communication strategies to control rat infestations. Specifically, the research asks: How do farmer groups use interpersonal communication strategies in managing rat infestations, and what are the implications for agricultural resilience and social cohesion?. The contribution of this study is threefold. First, it enriches agricultural communication literature by situating interpersonal communication within pest management, an area often overlooked in favor of innovation adoption or market access studies. Second, it demonstrates how farmer groups integrate traditional deliberative practices with digital tools such as WhatsApp, showing the hybridization of communication patterns in rural Indonesia. Third, it provides practical insights for policymakers, agricultural extension officers, and rural leaders in designing communication-based strategies for sustainable agriculture. This dual focus on theoretical and practical contributions enhances the value of the study for both academic and practitioner audiences. The study's limitations are acknowledged, particularly regarding the single-site case study design and the limited sample size, which may restrict generalizability. However, acknowledging these limitations does not diminish the study's contribution; instead, it highlights the need for further comparative research across different regions in Indonesia and beyond.

II. Literature Review and Hypothesis Development

2.1. Interpersonal Communication in Agricultural Contexts

Interpersonal communication has long been recognized as a crucial element of agricultural development, as it facilitates the exchange of information, practices, and social support among farmers. In rural settings, interpersonal communication goes beyond the transfer of knowledge; it also embodies cultural

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values, social cohesion, and relational trust (Solomon et al., 2021). Within farming communities, interpersonal communication facilitates mutual learning, builds social capital, and creates resilience against ecological and economic shocks. Studies in Southeast Asia and Sub-Saharan Africa consistently highlight that when farmers communicate directly, either through formal meetings or informal encounters, they are more likely to adopt coordinated agricultural practices (Mulyasara, 2025; Gailhard et al., 2015). In Indonesia, interpersonal communication occurs not only in routine agricultural cycles but also in response to crises such as pest infestations, floods, or prolonged droughts. Farmers in Yogyakarta, for example, rely on intensive face-to-face deliberations and informal field interactions to organise collective planting schedules, irrigation arrangements, and pest eradication campaigns (Sulaiman et al., 2024). These communication practices strengthen solidarity, which is often more valuable than material resources in conditions of scarcity.

2.2. Participatory and Dialogic Communication in Rural Development

The literature on participatory communication suggests that sustainable agricultural change is most effective when farmers are not passive recipients of information, but relatively active participants in decision-making processes (Wang et al., 2021). Dialogic communication, which emphasizes listening, reflexivity, and the co-creation of meaning, has been successfully applied in rural development programs across Asia, Africa, and Latin America. These approaches move beyond the "transfer of technology" paradigm toward inclusive platforms that integrate farmers' knowledge with scientific recommendations (Li et al., 2024).

In the Indonesian context, participatory approaches resonate with the local tradition of musyawarah (deliberative consensus meetings). These forums are deeply cultural, drawing upon values of equality, solidarity, and mutual respect. Recent research suggests that when participatory and dialogic methods are embedded in farmer groups, outcomes include higher levels of trust, greater adoption of innovations, and stronger accountability among members (Gailhard et al., 2015; Regan & Kenny, 2022). For pest management, which requires synchronized action, such participatory communication is indispensable.

2.3. Digital-Mediated Interpersonal Communication

The last decade has seen an exponential rise in digital communication platforms within farming communities. WhatsApp, Telegram, and other chat applications now complement face-to-face deliberations by providing immediacy and continuous connectivity. Digital tools enable the rapid exchange of information about pest sightings, weather changes, and market fluctuations (Sultan, 2024). Farmers use group chats to coordinate action, divide labour, and motivate reluctant members. The integration of digital platforms into farmer communication creates hybrid systems that merge traditional and modern practices, enhancing flexibility and responsiveness (Awad, 2021).

In Indonesia, studies show that WhatsApp groups have become central to farmer coordination. They provide a low-cost, accessible medium for sharing photos of pest damage, issuing reminders about scheduled eradication efforts, and discussing outcomes of interventions. Research in India, Kenya, and Brazil also demonstrates that digital-mediated interpersonal communication reduces coordination costs, expands farmer networks, and strengthens collective efficacy (Hartmann et al., 2021; Malhotra & Anand, 2020; Pivoto et al., 2019; Sultan, 2024). Thus, digitalization is not replacing traditional interpersonal communication but rather amplifying its reach.

2.4. Collective Action and Pest Management

Rodent infestations in irrigated rice systems represent a textbook case of collective action problems (S. Mulungu et al., 2020). Because rats are highly mobile, individual efforts at eradication are quickly undermined if neighboring farmers do not coordinate. The literature emphasizes that area-wide management synchronized planting, field sanitation, coordinated trapping, and biological control is essential for

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sustainable rodent management (Brotodjojo et al., 2023); (Nuriman et al., 2022). Collective action in pest management is heavily dependent on effective interpersonal communication. Farmers must reach consensus on timing, methods, and distribution of responsibilities. Without strong communication, free-riding becomes a problem, and collective efforts fail. Case studies from Indonesia, the Philippines, and China indicate that when farmer groups can build trust through intensive communication, they are more successful in reducing pest populations and minimizing crop losses (Li et al., 2024; Nuriman et al., 2022).

2.5. Conceptual Framework for Interpersonal Communication in Pest Management

Synthesizing insights from the literature, this study develops a conceptual framework that positions interpersonal communication as the central mediator between environmental pressures and collective action outcomes. The framework acknowledges that pest infestations serve as environmental drivers that elicit communicative responses within farmer groups (Mngadi, 2016). These responses are expressed through three primary mechanisms: (i) building trust and shared norms, (ii) engaging in joint planning and synchronized timing, and (iii) sustaining mutual monitoring and feedback loops. Contextual factors, including leadership legitimacy, support from agricultural extension services, digital access, and irrigation infrastructure, moderate the effectiveness of these mechanisms. Outcomes are not only agronomic, in terms of reduced crop losses, but also socio-organizational, reflected in increased participation and stronger cohesion, as well as communicative, measured by message reach, clarity, and responsiveness.

From this framework, several propositions are articulated to guide the analysis. First, the density and quality of interpersonal ties within the farmer group are expected to positively influence the synchrony of pest-control actions, as stronger and more frequent interactions facilitate shared understanding and coordinated timing. Second, the integration of chat-application communication with face-to-face deliberation is expected to enhance responsiveness to pest alerts and improve overall participation, as digital platforms offer immediacy. At the same time, traditional meetings ensure inclusiveness and legitimacy. Third, leadership communication, characterized by clarity, fairness, and credibility, is posited to moderate the relationship between interpersonal communication and sustained collective action across seasons, ensuring continuity and stability of group efforts. Finally, in contexts where biological control measures such as barn owl conservation are implemented, interpersonal communication plays a pivotal role in negotiating risk perceptions and aligning husbandry practices to minimize potential non-target harm.

The literature demonstrates that interpersonal communication is not merely an auxiliary component of agricultural practices but a central mechanism through which farmer groups organize, negotiate, and sustain collective action (Zeng et al., 2022). The reviewed studies highlight the importance of participatory dialogue, hybridization of face-to-face and digital communication, and the pivotal role of leadership in moderating outcomes. Building upon this synthesis, the present study develops a conceptual framework that situates interpersonal communication as a mediator between environmental stressors, specifically rat infestations, and collective pest management actions. This framework not only guides the interpretation of empirical findings but also informs the design of the research methodology. Accordingly, the following section elaborates on the methodological approach adopted to examine how farmer groups in Yogyakarta mobilize interpersonal communication strategies in the face of recurrent rat infestations.

This study is guided by two interrelated theoretical perspectives: Collective Action Theory and Participatory Communication Theory. Collective Action Theory (Olson, 2007; Ostrom, 2010) offers a valuable lens for understanding why farmers must coordinate in managing rat infestations. Rodents represent a common-pool problem, in which individual efforts are undermined if neighboring farmers do not collaborate. The theory highlights the challenges of free-riding, the importance of building shared norms, and the role of communication in sustaining cooperation over time. In this study, collective action theory explains how interpersonal communication serves as the mechanism through which synchrony in pest management practices is achieved (Mahdalena et al., 2021).

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Complementing this, Participatory Communication Theory underscores the dialogic and inclusive nature of communication in rural development (Tufte et al., 2020). Rather than viewing farmers as passive recipients of information, participatory communication emphasizes active involvement, shared learning, and decision-making based on dialogue and consensus. This perspective is particularly relevant in the Indonesian context, where musyawarah (deliberative consensus meetings) represents a deeply rooted cultural practice for resolving collective problems. By integrating these perspectives, the study situates interpersonal communication as the mediating process that enables collective action in pest management. The framework posits that trust, participation, and leadership communication serve as communicative resources through which farmers negotiate timing, align practices, and mobilize group action. At the same time, the hybridization of face-to-face and digital communication provides new opportunities and challenges for sustaining cooperation (Faruq et al., 2025).

III. Research Method

3.1. Research Design

This study applied a qualitative case study design to investigate how interpersonal communication shapes collective pest management within a farmer group in Yogyakarta. A case study was chosen because it enables an in-depth exploration of communicative processes in their natural settings (Yin, 2018). Rather than aiming for statistical generalization, the study prioritizes thick description and contextual understanding, which are essential when analyzing communication practices in localized rural communities. The perspective guided the approach, which posits that collective action is communicatively constituted. In other words, farmer coordination, decision-making, and problem-solving are not merely outcomes of structural arrangements but emerge through interaction, dialogue, and shared meaning-making (Servaes, 2018; Li et al., 2024).

3.2. Research Site and Context

The research was conducted in Gemblangan Village, Bantul Regency, Yogyakarta Special Region, Indonesia. The area is part of a rice-producing belt where smallholders rely heavily on irrigated paddy fields. The village has long-established farmer groups (kelompok tani) that function as platforms for agricultural extension, resource mobilization, and pest control initiatives. Rat infestation (Rattus argentiventer) poses a significant threat to rice production in this setting. Farmers often experience substantial crop losses unless collective strategies are undertaken, including synchronous planting, mechanical trapping, field sanitation, and biological control, such as barn owl conservation. These practices require strong interpersonal communication, making the site highly relevant for examining communicative dynamics in crisis management.

3.3. Participants and Sampling

Participants were selected using purposive sampling to ensure that the study captured a range of perspectives. In total, 10 key informants were included: the farmer group leader, four senior farmers with more than ten years of experience, three younger farmers in their twenties and thirties, one woman farmer involved in post-harvest activities, and one local extension officer. The inclusion criteria were: (1) active membership in the farmer group for at least one year, (2) direct involvement in pest control or collective farming activities, and (3) willingness to participate in the study. Snowball sampling was also used, where participants recommended others who played important roles in the group's communication processes. This combination ensured diversity in terms of generation, gender, and role within the sample.

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3.4. Data Collection Methods

Data were collected over six months, from February to July 2025, covering one complete planting and harvesting cycle. During this time, three complementary techniques were applied to obtain a rich and triangulated dataset. First, semi-structured interviews were conducted with all ten participants. These interviews explored a wide range of issues, including experiences of communication during pest management, perceptions of leadership, the role of WhatsApp and other communication tools, and processes of collective decision-making. Each interview lasted between sixty and ninety minutes, was conducted in Indonesian, and was audio-recorded with the participants' consent before being transcribed for analysis.

In addition to interviews, participant observation was employed to capture the natural flow of communicative practices. The researcher attended farmer group meetings, observed daily interactions in the rice fields, and joined collective activities such as rat hunting and barn owl nest inspections. Detailed field notes were kept to record non-verbal cues, informal conversations, and situational dynamics that might not have been fully articulated during interviews. To complement these sources, relevant documents were also collected, including meeting minutes, WhatsApp group messages, and agricultural extension pamphlets. These materials provided valuable evidence of how communication was formalized, shared, and archived within the group, and further strengthened the triangulation of data.

3.5. Data Analysis Procedures

The data were analyzed using a manual thematic analysis approach, following the six-step framework proposed by Braun and Clarke (2006). The process began with the researcher repeatedly reading transcripts and field notes to become familiar with the data. Open coding was then carried out manually, using printed transcripts and Excel spreadsheets to identify and label key segments of meaning. These codes were subsequently clustered into broader categories that reflected major concepts such as trust, participation, leadership communication, and digital mediation. The emerging themes were reviewed and refined several times to ensure their internal coherence and clear distinction from one another.

Once the themes were stabilized, they were defined and named in a way that captured the essence of farmers' communicative practices. Finally, a narrative account was produced in which the themes were illustrated with direct quotations from participants, allowing their voices to be foregrounded in the analysis. This combination of inductive coding and deductive reference to the conceptual framework developed in the literature review ensured that the findings were both grounded in the data and connected to broader theoretical debates.

IV. Results and Discussion

4.1. Interpersonal and Digital Communication in Collective Pest Management

The findings from the Gemblangan Village farmer group reveal that interpersonal communication forms the backbone of collective pest management. Farmers consistently described their everyday conversations, whether in the rice fields, at group meetings, or during informal gatherings, as essential spaces where information, experiences, and emotions were exchanged. In these settings, communication was not merely a technical function but a relational and cultural process. A farmer noted, "When we talk in the field, we do not only talk about rats, but also about family, prices, and the weather. From these conversations, we build trust that makes it easier to work together" (Interview, June 2025). This illustrates how interpersonal communication blends practical coordination with affective bonds, providing the relational infrastructure necessary for collective action.

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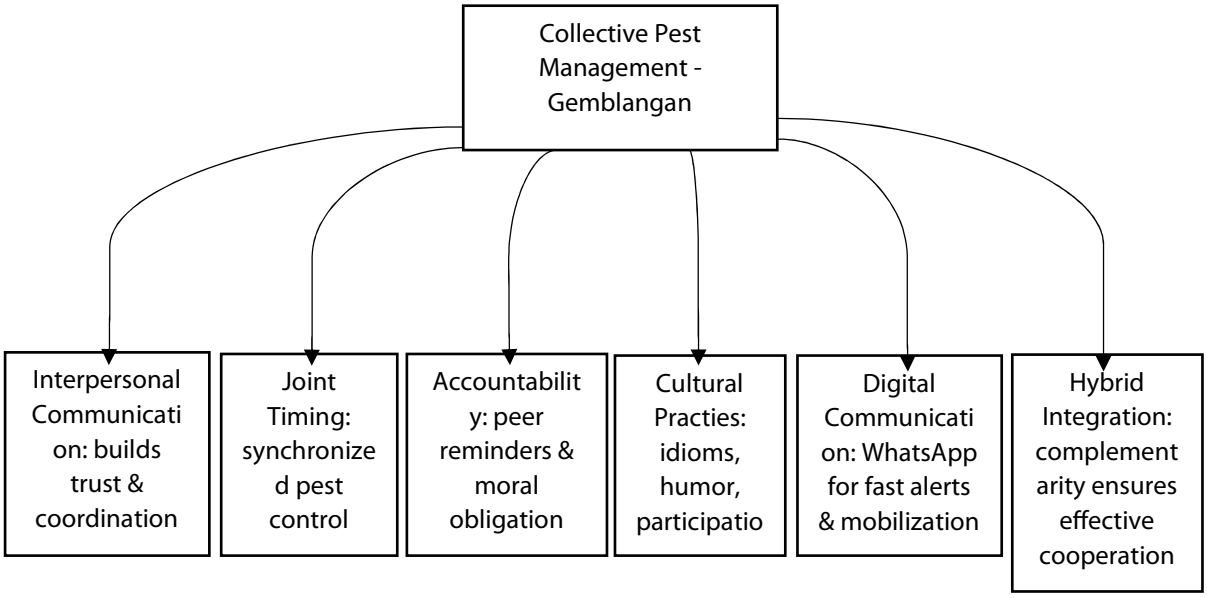

Figure 1. Communication Strategies in Pest Management

Interpersonal communication allowed farmers to synchronize the timing of their Pest control actions, which is critical in managing rat infestations. Rats, by their ecological nature, easily migrate from one plot to another. If pest control is performed unevenly, with some farmers acting and others delaying, the collective effort fails. Farmers in the study were acutely aware of this challenge. As one group leader explained, "If even one or two fields are left untreated, the rats just move there. That is why we must talk and decide together" (Interview, April 2025). Group meetings, often held in the evenings at the village hall, became the primary venue for reaching consensus on when and how pest eradication campaigns would be conducted. This finding resonates strongly with Collective Action Theory (Olson, 2007; Ostrom, 2010), which emphasizes the importance of communication in overcoming free-rider problems and ensuring cooperation in the management of common-pool resources. In this case, interpersonal communication functioned as a mechanism for monitoring and mutual accountability. Farmers reported that verbal reminders and peer pressure in group discussions were often more effective than formal sanctions. The ability to communicate face-to-face created a sense of moral obligation to participate in Pest control activities, reinforcing the collective identity of the group. Similar findings have been reported in recent research on agricultural cooperation in India, where interpersonal dialogue has been shown to reduce coordination failures in pest management and irrigation (Shah, 2022).

Beyond coordination, interpersonal communication was also deeply embedded in cultural practices. Farmers frequently employed local idioms, proverbs, and humor during their interactions, which served to ease tensions and encourage participation. During one observed meeting, the group leader used a Javanese saying, "tikus iku ora iso diajak rembugan, nanging wong iso diajak rembugan" ("rats cannot be negotiated with, but people can be"), to underline the urgency of coordinated action. Such cultural expressions reframed the pest problem not only as an agronomic issue but also as a moral and communal responsibility. In another instance, humor was used to lower barriers to participation; farmers teased each other in a friendly manner about who had seen the "biggest rat," turning a serious issue into a shared story that encouraged joint action. This aligns with Participatory Communication Theory (Suzina et al., 2020), which argues that communication in development settings must be dialogic, culturally grounded, and empowering. By engaging in deliberative dialogue (musyawarah), farmers not only exchanged information but also reaffirmed the cultural values of togetherness and collective responsibility. These practices helped sustain resilience in the face of recurring crises, enabling the group to respond to pest threats with unity and determination. Recent studies in

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Southeast Asia (Li et al., 2024) confirm that cultural forms of dialogue within farmer groups enhance solidarity, thereby ensuring collective responses to ecological risks.

While face-to-face communication remained central, digital platforms, particularly WhatsApp, emerged as crucial tools in complementing interpersonal exchanges. Every participant reported being part of the group's WhatsApp chat, which functioned as both an alert system and a discussion space. Farmers shared real-time information, such as sightings of rat nests or crop damage, often accompanied by photos. One participant remarked, "When someone posts a picture of rat damage, others immediately reply and sometimes suggest what to do. It is faster than waiting for a meeting" (Interview, May 2025). The immediacy of WhatsApp communication increased responsiveness to pest threats. In several instances observed during fieldwork, farmers organized spontaneous rat hunting activities within hours after a post was shared in the group. Such digital mediation enabled flexibility and rapid mobilization, features that traditional meetings could not always provide. However, participants also emphasized that WhatsApp did not replace face-to-face deliberation. Decisions requiring consensus, such as scheduling a village-wide eradication campaign, were still made during in-person meetings. In this sense, digital communication was integrated with, rather than substituted for, interpersonal interaction.

This hybridization aligns with broader findings in recent communication scholarship, which highlight how rural communities are increasingly blending traditional forms of dialogue with digital platforms (Chib, 2019; Li et al., 2024). It also extends Participatory Communication Theory by showing that dialogic processes can evolve in multichannel environments. The case of Gemblangan demonstrates that digital platforms can enhance participation when anchored in a culture of face-to-face deliberation, rather than supplanting it. Despite its advantages, digital communication also presented challenges. Some older farmers admitted difficulty in following discussions on WhatsApp, either because of limited digital literacy or because they lacked smartphones with reliable internet access. In these cases, younger members often acted as mediators, relaying information from WhatsApp to their parents or neighbors. This generational gap occasionally produced delays in participation, highlighting persistent inequalities in access to technology. Moreover, the informality of WhatsApp communication sometimes led to misunderstandings. For instance, one farmer noted that instructions shared via text could be interpreted differently, leading to confusion about the exact timing of activities. As he explained, "If you only read the message, sometimes it is not clear. In meetings, we can ask directly if something is unclear" (Interview, July 2025). This underscores the enduring value of face-to-face communication, where immediate clarification and mutual understanding are more easily achieved.

Taken together, the findings suggest that effective pest management in Gemblangan Village depended not on one mode of communication alone but on the strategic integration of interpersonal and digital practices. Interpersonal communication provided the relational depth, cultural resonance, and moral accountability necessary for cooperation. Digital platforms, in turn, offered speed, reach, and immediacy, enabling timely responses to emerging threats. Farmers themselves recognized the complementarity of these modes. As one group leader observed, "WhatsApp is like an alarm, but meetings are the agreement. We need both" (Interview, April 2025). This synthesis advances our understanding of communication in collective action. While Collective Action Theory has long emphasized the role of communication in enabling cooperation, the case demonstrates that the quality and integration of multiple communication channels are equally important. It also illustrates how participatory communication, traditionally centered on face-to-face dialogue, can evolve to include digital interactions without losing its cultural grounding. By highlighting these dynamics, the study not only fills a gap in Indonesian agricultural communication research but also contributes to global debates on the role of hybrid communication systems in sustaining rural cooperation. These findings carry practical implications. For farmer groups, strengthening interpersonal ties remains indispensable, but digital literacy should also be expanded to ensure inclusivity across generations. For extension officers, recognizing the complementary roles of WhatsApp and face-to-face deliberation can inform the development of more responsive agricultural programs. For policymakers, investing in rural connectivity and training could enhance collective action in pest management while respecting cultural

traditions of dialogue. Such measures can help ensure that communication, in all its forms, continues to serve as the foundation of farmer resilience in the face of ecological challenges.

4.2. Leadership Communication and the Sustainability of Farmer Cooperation

The role of leadership emerged as a central factor in sustaining cooperation among farmers in Gemblangan Village. While interpersonal and digital communication provided the channels through which information was shared and actions were coordinated, leadership communication served as the anchor that ensured consistency, fairness, and trust over time. (Kartikasari et al., 2025). Farmers repeatedly highlighted the importance of their group leader's ability to communicate clearly, to mediate disagreements, and to motivate participation during periods of fatigue or uncertainty. As one member explained, "We listen to the leader because he speaks not only about what needs to be done, but why it matters. When he talks, we feel responsible" (Interview, May 2025). Leadership communication in this context was not hierarchical in the conventional sense but participatory and relational. The leader often began meetings by acknowledging the contributions of members and then opened the floor for dialogue before making any collective decisions. This practice was described by farmers as "fair" and "inclusive," contrasting with experiences in neighboring groups where leaders were more directive. By framing leadership as facilitative rather than authoritarian, the Gemblangan leader fostered an environment where members felt that their voices were valued. This aligns with research on participatory leadership in rural communities, which shows that leaders who act as facilitators rather than commanders are more likely to sustain long-term cooperation (Nair & George, 2021; (Gagliardi et al., 2020).

One critical dimension of leadership communication was the ability to maintain credibility. Farmers repeatedly emphasized that they followed the leader because he was perceived as jujur (honest) and teges (firm but fair). Credibility was reinforced through consistency: the leader not only issued instructions but also participated in rat-hunting activities, demonstrating solidarity with members. Such credibility is crucial in collective action settings, where free-rider problems can easily undermine group efforts. Olson's (2007) The Theory of collective action suggests that individuals are less likely to participate if they doubt others' commitment; in Gemblangan, leadership communication helped counteract this tendency by signaling reliability and mutual accountability. Trust was also reinforced through symbolic communication. During one observed meeting, the leader employed a simple yet effective act of sharing food and tea with all members before initiating formal discussions. Farmers interpreted this gesture as a sign of equality and solidarity, reinforcing their willingness to participate. This echoes findings from recent studies in African farmer cooperatives, where symbolic rituals performed by leaders strengthened group cohesion and reduced attrition. (Auma et al., 2022). Communication here extended beyond verbal exchanges to encompass embodied practices that carried relational meaning.

Leadership communication also played a vital role in bridging generational differences within the group. Younger farmers, often more digitally literate, were sometimes impatient with older members who struggled with WhatsApp. The leader mediated these tensions by encouraging patience and by arranging mixed-age teams during rat-hunting campaigns. As one younger participant recalled, "Pak Ketua told us, do not laugh at the older farmers if they do not use WhatsApp. Teach them, and work together in the field" (Interview, June 2025). This intervention highlights how leadership communication not only manages logistics but also nurtures inclusivity, ensuring that no subgroup feels marginalized. In terms of sustaining cooperation across agricultural seasons, leadership communication provided continuity. Farmers acknowledged that pest eradication is not a one-time effort but a recurring necessity. Participation often declines after the initial urgency wanes, as members grow fatigued or focus on other farming tasks. The leader's ability to reframe pest management as a long-term collective responsibility was critical in countering this decline. He frequently reminded members that, "If we only act once, the rats will return. We must continue, even if it is tiring" (Observation, July 2024). Such framing is consistent with findings in sustainability studies, where leaders who maintain a long-term vision are better able to preserve group commitment (Klerkx & Begemann, 2020).

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At the same time, leadership communication was not without its challenges. Some farmers expressed concerns that decisions occasionally favored those with larger landholdings, particularly in debates over scheduling. One farmer commented, "Sometimes the timing seems better for the big landowners than for us with small plots" (Interview, July 2025). Although such concerns were not widespread, they indicate the potential for communication breakdowns when inclusivity is perceived to be compromised. This underlines the importance of fairness as a communicative performance of leadership: once fairness is questioned, participation may decline. Interestingly, leadership communication in Gemblangan was also linked to ecological experimentation. The group leader actively promoted barn owl (Tyto alba) conservation as a biological control strategy, framing it not as an external imposition but as a community innovation. He communicated the idea by organizing a village storytelling session about the role of owls in local folklore, thereby aligning scientific recommendations with cultural narratives. Farmers reported that this approach reduced skepticism and increased willingness to adopt owl-friendly practices, such as avoiding the use of rodenticides near nesting areas. This case illustrates how effective leadership communication can bridge the gap between scientific knowledge and local culture, an aspect that is increasingly emphasized in agricultural extension literature. (Mulyasara, 2025); (Adnan et al., 2023).

From a theoretical perspective, the Gemblangan case illustrates how leadership communication moderates the relationship between interpersonal exchanges and collective action outcomes. While interpersonal communication builds solidarity and digital communication enhances speed, leadership communication ensures that these processes are coordinated, inclusive, and sustained over time. In other words, leadership serves as the glue that binds diverse communicative practices into a coherent system of collective action. This extends Collective Action Theory by highlighting not only the structural conditions of cooperation but also the communicative performances that leaders enact to stabilize participation. The findings also contribute to contemporary debates on participatory leadership. Much of the literature has focused on formal organizations or urban movements, but less attention has been given to rural contexts facing ecological crises. The Gemblangan case suggests that participatory leadership in such settings requires striking a balance between inclusivity and decisiveness, cultural sensitivity and innovation, and fairness and strategic direction. Leadership communication, when executed effectively, transforms pest management from a technical intervention into a collective project of resilience.

Practically, these insights have several implications. For farmer groups, leadership development programs should emphasize not only technical skills but also communicative competencies such as facilitation, mediation, and cultural framing. For extension officers, supporting leaders in rural communities should involve training in dialogic communication and inclusive decision-making. For policymakers, recognizing the communicative dimensions of leadership can inform programs that strengthen social capital, thereby enhancing the sustainability of collective pest management efforts. In summary, leadership communication in Gemblangan Village demonstrates how clarity, credibility, fairness, and cultural sensitivity facilitate the sustainability of farmer cooperation. While interpersonal and digital communication provide the channels for immediate coordination, it is leadership communication that nurtures trust, manages diversity, and maintains long-term commitment. Without such leadership, collective pest management would likely falter, succumbing to coordination failures, generational divides, and declining participation. By highlighting this dynamic, the study underscores the indispensable role of communication as both the medium and the substance of leadership in sustaining collective action against ecological threats.

V. Conclusion

This study has demonstrated that communication plays a central role in how farmer groups in Gemblangan Village manage rat infestations, one of the most significant threats to rice production. Interpersonal dialogue-built trust, solidarity, and moral accountability, while WhatsApp provided immediacy and flexibility in coordinating responses. Leadership communication served as the integrative force, aligning face-to-face and digital exchanges with fairness, credibility, and cultural sensitivity. Together, these

communicative practices demonstrate that collective action in agriculture is not only a matter of technical coordination but also of sustaining relationships and cultivating resilience.

Theoretically, the findings contribute to both Collective Action Theory and Participatory Communication Theory by highlighting how hybrid communication—rooted in cultural dialogue, strengthened by digital tools, and stabilized by credible leadership—facilitates cooperation during ecological crises. Practically, the results highlight the need to strengthen farmers' leaders' communicative competencies, improve digital literacy across generations, and design extension programs that integrate traditional deliberation with new technologies. Such measures can enhance not only pest management but also broader forms of rural cooperation.

Future research should expand beyond this single case study to investigate whether in the area similar communicative dynamics prevail in different regions, crops, and ecological contexts. Comparative studies across farmer groups or mixed-method approaches could illuminate variations in how interpersonal, digital, and leadership communication interact. Longitudinal research would also help capture how communicative practices evolve as digital platforms become more embedded in rural life. By pursuing these directions, scholars can deepen our understanding of communication as the foundation of agricultural resilience in an era of ecological uncertainty.

References

Adnan, R. M., Mostafa, R. R., Dai, H., Kuriqi, A., Kisi, O., Muhammad, R., Mostafa, R. R., & Dai, H. (2023). Mechanics Pan evaporation estimation by relevance vector machine tuned with new metaheuristic algorithms using limited climatic data. 2060. https://doi.org/10.1080/19942060.2023.2192258

Auma, C. M. N., Mweu, M. M., & Opiyo, R. O. (2022). Performance of Malnutrition Universal Screening Tool and Patient-Generated Global Subjective Assessment in screening for cancer-related malnutrition in Nairobi, Kenya [version 1 ; peer review : awaiting peer review]. 1–13.

Awad, M. (2021). Digitization of agricultural extension. International Journal of Modern Agriculture and Environment, 1(2). https://doi.org/10.21608/ijmae.2023.214939.1007

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brotodjojo, R. R., Lazuardi, I., & Suprihanti, A. (2023). Population Distribution of Rats (Rattus argentiventer) and the Damage Intensity on Rice and Other Crops in Pleret, Yogyakarta, Indonesia. Jpt Jurnal Proteksi Tanaman (Journal of Plant Protection), 7(2), 115. https://doi.org/10.25077/jpt.7.2.115-126.2023

Chib, S. (2019). Facilitating Employee Retention through Employee Engagement and Organization Commitment. Journal of Information and Computational Science, 9(9).

Faruq, M., Wardiyanto, B., Umpain, S. H., & Toyib, M. (2025). Collaboration of Stakeholders and AI in The Implementation of New Public Service in The Digital Era. 5, 63–70.

Gagliardi, I., Patella, G., & Michael, A. (2020). COVID-19 and the Kidney : From Epidemiology to Clinical Practice. July.

Gailhard, İ. U., Bavorová, M., & Pirscher, F. (2015). Adoption of agri-environmental measures by organic farmers: The role of interpersonal communication. Journal of Agricultural Education and Extension, 21(2), 127–148. https://doi.org/10.1080/1389224X.2014.913985

Hartmann, G., Nduru, G., & Dannenberg, P. (2021). Digital connectivity at the upstream end of value chains: A dynamic perspective on smartphone adoption amongst horticultural smallholders in Kenya. Competition and Change, 25(2). https://doi.org/10.1177/1024529420914483

Kartikasari, R., Suyoso, A. L. A., & Agustina, T. S. (2025). Literature Review of Transformational Leadership: A Study of Effective Leadership Strategy. Golden Ratio of Human Resource Management, 5(1), 169–176. https://doi.org/10.52970/grhrm.v5i1.744

Klerkx, L., & Begemann, S. (2020). Supporting food systems transformation : The what, why, who, where, and how of mission-oriented agricultural innovation systems. Agricultural Systems, 184(June), 102901. https://doi.org/10.1016/j.agsy.2020.102901

Li, X., Yang, L., & Lu, Q. (2024). Does Social Learning Promote Farmers' Cooperative Pest Control?—Evidence from Northwestern China. Agriculture (Switzerland), 14(10). https://doi.org/10.3390/agriculture14101749

Mahdalena, M., Haliah, H., Syarifuddin, S., & Said, D. (2021). Budget Accountability from The Perspective of Habermas' Communicative Action Theory. Golden Ratio of Social Science and Education, 1(2), 61–72. https://doi.org/10.52970/grsse.v1i2.73

Malhotra, C., & Anand, R. (2020). Accelerating public service delivery in India: Application of Internet of Things and Artificial Intelligence in Agriculture. ACM International Conference Proceeding Series. https://doi.org/10.1145/3428502.3428510

Mngadi, N. (2016). Factors facilitating pest infestation in two low-income urban areas of Cape Town, South Africa: an urban health observation study. In Journal of Chemical Information and Modeling.

Mulyasara, A. (2025). Communication Dynamics in Farmer Groups: Enhancing Food Security Programs Through Agricultural Collaboration. Holistic: Journal of Tropical Agriculture Sciences, 2(2), 98–111. https://doi.org/10.61511/hjtas.v2i2.2025.1634

Nuriman, H., Kurniasih, N., Fauzi, R., Kusnadi, A. E., & Cecep, C. (2022). Proceedings of the Conference on Digital Humanities 2022 (CODH 2022). In Proceedings of the Conference on Digital Humanities 2022 (CODH 2022) (Issue 2017). Atlantis Press SARL. https://doi.org/10.2991/978-2-494069-69-5

Olson, M. (2007). The Logic of Collective Action [1965]. Contemporary Sociological Theory, 2.

Ostrom, E. (2010). Analyzing collective action. Agricultural Economics, 41(SUPPL. 1). https://doi.org/10.1111/j.1574-0862.2010.00497.x

Pivoto, D., Barham, B., Waquil, P. D., Foguesatto, C. R., Corte, V. F. D., Zhang, D., & Talamini, E. (2019). Factors influencing the adoption of smart farming by Brazilian grain farmers. International Food and Agribusiness Management Review, 22(4). https://doi.org/10.22434/IFAMR2018.0086

Regan, Á., & Kenny, U. (2022). What Do the Public Want to Know about Farming and Why? Findings from a Farmer-Initiated Public Consultation Exercise in Ireland. Sustainability (Switzerland), 14(9). https://doi.org/10.3390/su14095391

S. Mulungu, L., M. Mchukya, B., & L. Mnyone, L. (2020). Trap Barrier System (TBS) as a New Tool for Rodent Pest Management in Irrigated Rice in Africa. In Pest Control and Acarology. https://doi.org/10.5772/intechopen.81828

Saridewi, L. P., & Annisa, L. H. (2025). Use of Information and Communication Technology at the Farmer Level in Kebumen Regency, Indonesia. 5, 39–45.

Shah, D. (2022). Role of Information and Communication Technology in Agricultural Development of India. Review of Market Integration, 14(2–3). https://doi.org/10.1177/09749292221119286

Solomon, D. H., Brinberg, M., Bodie, G. D., Jones, S., & Ram, N. (2021). A Dynamic Dyadic Systems Approach to Interpersonal Communication. Journal of Communication, 71(6), 1001–1026. https://doi.org/10.1093/joc/jqab035

Sulaiman, A. I., Rosyadi, S., Handoko, W., Masrukin, M., Putri, D. D., Wijayanti, I. K. E., & Faozanudin, M. (2024). The Importance of Participatory Communication in Development Planning Deliberations for Agritourism Village Enhancement. Journal of Intercultural Communication, 24(1), 144–160. https://doi.org/10.36923/jicc.v24i1.246

Sultan, Z. (2024). The Role of Effective Communication in Harmonizing Work Relations and Increasing Employee Work Productivity. Golden Ratio of Human Resource Management, 4(2), 207–214. https://doi.org/10.52970/grhrm.v4i2.455

Suzina, A. C., Tufte, T., & Jiménez-Martínez, C. (2020). Special issue: The legacy of Paulo Freire. Contemporary reflections on participatory communication and civil society development in Brazil and beyond. In International Communication Gazette (Vol. 82, Issue 5). https://doi.org/10.1177/1748048520943687

ISSN [Online]: 2797-5827

Tufte, T., Jiménez-Martínez, C., & Suzina, A. C. (2020). De-constructing participatory communication and civil society development in 2020: a perspective inspired by Paulo Freire. Commons, 9(2). https://doi.org/10.25267/commons.2020.v9.i2.01

Wang, Z., Wang, J., Zhang, G., & Wang, Z. (2021). Evaluation of agricultural extension service for sustainable agricultural development using a hybrid entropy and TOPSIS method. Sustainability (Switzerland), 13(1). https://doi.org/10.3390/su13010347

Zeng, Y., Qiu, F., & Zhang, J. (2022). The impacts of observational learning and word-of-mouth learning on farmers' use of biogas in rural Hubei, China: does interpersonal trust play a role? Energy, Sustainability and Society, 12(1). https://doi.org/10.1186/s13705-022-00350-8