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Integrating Group Dynamics into Technopark Rice-Fish Farming Management: Strategies and Outcomes

Integrasi Dinamika Kelompok dalam Manajemen Budidaya Padi dan Ikan Technopark: Strategi dan Hasil

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ABSTRACT

This study explores group dynamics in the management of Technopark Rice-Fish Farming, focusing on role distribution, effective communication, conflict resolution, and inclusive decision-making. Employing a qualitative method with an interpretivist approach, the research delves into the personal and social experiences of stakeholders in Dusun Samberembe, Sleman—an iconic Rice-Fish Farming site in Indonesia utilizing the jajar legowo method. Data were collected through field observations and interviews with management teams, youth organizations, and the local community, then analyzed to produce findings of significant relevance. The findings reveal that group dynamics play a pivotal role in promoting sustainability and productivity at Technopark Rice-Fish Farming. Collaboration across takeholders has facilitated the integration of technology and local resources, overcoming challenges such as differing visions, missions, and climate change impacts. Notably, the integration of technological and social approaches has boosted productivity by up to 30% compared to conventional methods. This study highlights that the strength of group dynamics extends beyond productivity gains to the human connections forged among individuals. The study also emphasizes that the strength of group dynamics extends beyond productivity, fostering solidarity and human connections that serve as a foundation for addressing challenges and driving sustainable innovation. These insights offer valuable implications for the management of other integrated agricultural systems.

Keywords: group dynamics, rice-fish farming, sustainable agriculture, integration

ABSTRAK

Penelitian ini mengeksplorasi dinamika kelompok dalam pengelolaan Minapadi Teknopark, yang mencakup pembagian peran, komunikasi efektif, penyelesaian konflik, dan pengambilan keputusan yang inklusif. Studi ini menggunakan metode kualitatif dengan pendekatan interpretivis untuk menggali pengalaman personal dan sosial para pemangku kepentingan di Dusun Samberembe, Sleman—ikon Minapadi di Indonesia yang menerapkan metode jajar legowo. Data diperoleh melalui observasi lapangan, wawancara dengan tim pengelola, organisasi pemuda, serta masyarakat sekitar, dan dianalisis untuk menghasilkan kesimpulan berbasis signifikansi temuan. Hasil penelitian menunjukkan bahwa dinamika kelompok di Minapadi Teknopark memainkan peran penting dalam mendorong keberlanjutan dan produktivitas. Kolaborasi antar individu dan kelompok memungkinkan tercapainya sinergi dalam pemanfaatan teknologi dan sumber daya lokal, meskipun tantangan seperti perbedaan visi, misi, serta dampak perubahan iklim tetap ada. Integrasi pendekatan teknologis dan sosial ini meningkatkan produktivitas hingga 30% dibanding metode konvensional. Penelitian ini menyoroti bahwa kekuatan dinamika kelompok tidak hanya pada hasil produktivitas semata, tetapi juga pada hubungan manusiawi yang terbangun di antara individu. Solidaritas yang tumbuh menjadi landasan penting dalam menghadapi tantangan dan membawa inovasi yang berkelanjutan. Minapadi Teknopark, dengan segala proses dinamisnya, menawarkan pelajaran berharga yang relevan untuk diterapkan dalam pengelolaan sistem pertanian terpadu lainnya.

Kata kunci: dinamika kelompok, Minapadi, pertanian berkelanjutan, regulasi.

INTRODUCTION

Indonesia ranks 7th in wealth among 47 Asian nations, covering over 7.81 million square kilometers and is rich in both land and marine natural resources. The country's agricultural, plantation, and mining potentials, spanning from Sabang to Merauke, must be carefully managed to maximize its

biological wealth (Dusni, 2018). As an agrarian nation, Indonesia's vast agricultural lands are crucial to its economy, providing food for over 270 million people and supporting millions of farmers. However, the agricultural sector faces numerous challenges, including land degradation, limited technological advancements, and unpredictable climate conditions, all of which contribute to declining productivity (Safitri, 2019; Setiawati et al., 2019; Wijayanti & Nursalim, 2023). Therefore, sustainable land management practices are essential to ensuring food security, farmer well-being, and environmental conservation.

Innovation in the agricultural and fisheries sectors is key to addressing food security challenges and improving farmer welfare. One such innovation is the rice-fish farming system, which integrates fish farming with rice cultivation on the same land. This system enhances agricultural productivity and provides both ecological and socio-economic benefits, such as reducing pesticide use, improving soil fertility, and offering both carbohydrates and protein (Nabila et al., 2024). Rice farming plays a central role in meeting human food needs and ensuring global food security. Given the global reliance on rice as a staple food, the sustainability of rice production is critical to addressing worldwide food challenges. However, beneath the seemingly simple image of farmers working in the fields lies a complex dynamic that involves various actors, government policies, and environmental factors that influence food security and the economic sustainability of local communities.

Rice is a staple crop in Indonesia, dominating the agricultural sector, with paddy fields covering 10.20 million hectares in 2023. However, this area is projected to decline by 2024 due to land conversion and urbanization, threatening food production and necessitating urgent attention to agricultural policies to ensure future food security (Badan Pusat Statistik, 2023). While rain-fed paddy fields are widely used, this method does not always correlate with increased rice yields. Previous research showed that rain-fed fields produced yields 28% lower than irrigated fields using the System of Rice Intensification (Mulyani et al., 2022). To address this challenge, some farmers have adopted a rice-fish farming system that optimizes water use by integrating fish farming with rice cultivation.

The rice-fish farming system enhances nutrient availability for rice plants (Mahmudiyah & Soedradjad, 2018), and increases organic matter content through the decomposition of leftover feed and weeds. This system benefits farmers financially due to its low input requirements and supports environmental sustainability. Its main objectives are to increase paddy field productivity, promote sustainable agricultural practices, and create a balanced ecosystem where fish waste serves as a natural fertilizer.

Technopark, as a center for agricultural innovation (Efit, 2021; Soesilowati et al., 2020), plays a strategic role in developing and promoting the rice-fish farming system. However, the siccessful implementation of this system depends not only on technology and agricultural methods but also on the dynamics of the farmer groups involved. Group dynamics strategies are crucial for effective management of the rice-fish farming system, where collaboration, active participation, and collective decision-making significantly influence the program's outcomes. Despite the promising potential of the rice-fish farming system, limited research exists on how group dynamics affect its success, particularly in Technopark management.

Previous research shows various perspectives on leadership and group dynamics in farmer group management. Popana et al. (2023) in their research in Waiheru Village, Ambon City, highlighted the important role of leadership in influencing the cohesion, collaboration and effectiveness of farmer groups. The focus of this research is on the leader's ability to motivate, resolve conflicts, and make decisions that play an important role in guiding the group to achieve effective and efficient results. The impact of leadership on the success of farmer groups is the main finding in this study.

Meanwhile, Damanik (2013) in her research in Pulokencana Village, Serang District, emphasized that effective leadership is a key factor in improving farmer group dynamics. This research highlights how quality leadership affects the group's ability to work together, achieve goals, and maintain members' motivation. Damanik's focus was more on increasing the effectiveness of farmer groups as a contribution to agricultural development.

In contrast to the two previous studies, (Poluan et al., 2017) examined the dynamics of the Maesaan Waya farmer group in Manembo Village, South Langowan District. The results showed that 80% of the groups had positive dynamics, but there were still 20% aspects that needed to be improved. Poluan emphasized on evaluating the elements of group dynamics, such as member integration, communication, and teamwork, which contribute to the overall success and productivity of the farmer

group. Most of the previous studies focused on aspects of leadership and group dynamics in achieving work effectiveness and productivity of farmer groups, but did not specifically explore in-depth social factors such as task sharing, role rotation, and inter-group collaboration mechanisms in the management of Technopark Rice-Fish Farming.

This study fills several gaps in the existing literature by exploring how group dynamics contribute to the success of rice-fish farming systems, using Technopark as a case study. First, it addresses the limited attention given to internal management structures within farmer groups. While previous research has largely emphasized the role of group leaders, this study highlights how rotational leadership fosters shared accountability, reduces dependency on specific individuals, and strengthens group cohesion. Second, although the role of technology in agriculture has been widely explored, few studies have examined its function in enhancing collaboration among farming groups. At Technopark, technology not only streamlines management but also supports real-time monitoring of land conditions and group performance. Finally, this research examines multi-group collaboration—an area often overlooked in studies that focus on single-group dynamics. Technopark's model, involving five cooperative groups, enables integrated task distribution, efficient resource use, and added value through coordinated harvest outcomes.

By addressing these gaps, this study provides fresh insights into the management of rice-fish farming systems based on group dynamics. The findings are expected to contribute to the literature on sustainable agricultural practices and offer recommendations for stakeholders involved in designing more effective integrated agricultural management policies. Ultimately, this research aims to enhance farmer welfare and strengthen national food security by promoting more efficient, collaborative, and sustainable agricultural practices.

METHODS

This study employs a qualitative descriptive approach, with data collected from informants related to social activities within the context of educational tourism focused on agricultural technology at the local level in Indonesia (Lexy J. Moleong, 2007). The Technopark Rice-Fish Farming site in Samberembe, Sleman, was selected due to its status as a prominent rice-fish farming project in Indonesia, which employs the jajar legowo planting method. Moreover, the transformation of its core business from agriculture to a Technopark tourism site, offering educational programs on rice-fish farming and horticultural crop management, reinforces the rationale for selecting this location. This transformation also aligns with the site's potential for knowledge dissemination to other regions, demonstrating its scalability. Given these factors, the study adopted an interpretive paradigm, where participants interpret their experiences within their social context. Data were collected through observation, interviews, and document analysis. The fieldwork involved direct visits to observe the application of the *jajar legowo* technique, fish-rice farming using biofloc microfish technology, and horticultural crop development. The observation was conducted using a non-participant approach to identify facts and phenomena in the field (Arikunto, 2002), particularly those related to educational tourism based on sustainable agricultural technology and the group dynamics strategies that have evolved over a decade. The observation process was carried out in May 2024, following the initial visit in 2023. Additionally, interviews were conducted with informants to validate the observational data after gaining an empirical understanding of the situation at the site (Strauss & Corbin, 2003).

This study explores the strategies used in group dynamics, including the internal and external factors that arise, stakeholder roles, and the sustainability of rice-fish farming. The informants in this study included members of the rice-fish farming management team, youth organizations, and the local community to seek and understand data to draw logical and theoretical conclusions. All informants were anonymized to avoid conflicts among stakeholders. This anonymity was also intended to facilitate more profound interviews and ensure that informants felt comfortable providing information openly. Direct quotes from the interviews are included in the writing as part of data interpretation.

The interview data were analyzed through thematic analysis, employing a series of systematic steps to derive meaningful insights. The initial step was familiarization with the data, during which the researcher thoroughly reviewed and engaged with the collected information. This process involved reading and analyzing the data to identify significant patterns and preliminary themes, laying the groundwork for further analysis (Majumdar, 2018).

The second step, generating initial codes, entailed highlighting relevant portions of the data and assigning codes based on their connection to the research questions and theoretical framework. These codes formed the basis for identifying broader patterns within the dataset.

In the third step, identifying themes, the researcher examined the data to uncover recurring patterns or topics that held relevance to the study (Maguire & Delahunt, 2017). At this stage, the codes were grouped and refined into overarching themes that represented the shared elements of the data.

The fourth step, reviewing themes, involved assessing and refining the identified themes to ensure consistency and alignment with the encoded data and the entire dataset. This stage was divided into two processes: verifying that each theme accurately reflected the underlying data and ensuring that all themes were coherent and relevant across the dataset (Clarke & Braun, 2014; Majumdar, 2018).

The fifth step, defining and naming themes, required a detailed examination and labeling of each theme to accurately capture its relationship to the research problem and the overall findings. This step ensured that the themes reflected the study's key insights and theoretical implications (Majumdar, 2018)

Finally, the presentation of the final results integrated the themes and codes into a cohesive narrative. This phase provided a structured and comprehensive response to the research questions, linking the findings to the overarching themes and highlighting their significance within the study. The final stage of this study focuses on formulating conclusions that emphasize the importance of the findings, highlight the implications of the results, and present recommendations as the key aspects addressed.

RESULTS AND DISCUSSION

Profile and Development of Samberembe Technopark Rice-Fish Farming

The Technopark Rice-Fish Farming is located in Samberembe Hamlet, Candibinangun Village, Pakem District, on the slopes of Mount Merapi. This fertile area has significant agricultural potential, employing the *jajar legowo* planting method, which has been developed into an educational tourism concept. Initially, the village focused on rice farming for local food security, with harvests primarily stored for personal consumption and the remainder sold. In 2010, a fish farming group was established as part of an extension initiative led by an extension worker from the Sleman Fisheries Department.

Two years after the launch of Rice-Fish Farming Technopark, the Yogyakarta Agriculture Department continued its development with a focus on experimenting with the rice-fish farming concept. This program involved testing various rice plant varieties, experimenting with different planting techniques, and evaluating different fertilizers. In 2019, the Special Region of Yogyakarta Government organized the Regional Week for Leading Farmers and Fishermen Groups (KTNA), featuring rice-fish Farming as an essential location for demonstrating agricultural and fisheries technology. This event marked the transition of rice-fish farming in Samberembe Hamlet into an integrated technology center, also encompassing horticulture. The success of this program contributed to the formation of the Processing and Marketing Group (Poklahsar), which facilitated collaborations with leading agricultural companies. Companies such as Panah Merah Bibit (PT. East West Seed), Pupuk Paten Frensoil F1 (Tunas Makmur), and Star Seed have collaborated with Rice-Fish Farming Technopark for branding and product promotion. This innovation has also led to an increase in local community income, with an average rise of 45%, attributed to implementing an educational tourism concept that integrates agricultural and aquaculture technology.

Specific guidelines must be adhered to when implementing the rice-fish farming concept using the *jajar legowo* method. This concept involves the construction of rice fields with fish ponds and ditches. Approximately 20% of the land area is allocated for ponds, while the remaining area is used for rice cultivation. The ditches should measure 80-100 cm in length and 60 cm in depth. The fish ponds, which must be equipped with a water flow system, should have a width of 200-300 cm and a minimum depth of 80 cm. The rice fields are equipped with plastic mulch around the edges to prevent seepage from the bunds and side nets to protect against pests such as otters and civets. Overhead nets are used to protect against birds. The rice variety used is a long-duration type that is resistant to waterlogging. It is planted using the *jajar legowo* system, with a row spacing of 20 cm and an in-row spacing of 10 cm. The fish species cultivated are red tilapia, stocked at a density of 2-3 fish per meter, with individual fish weighing between 20-25 grams.

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The horticultural fish farming system comprises fish ponds and surrounding ditches, with 20% of the total land area designated for the ponds. The ditches encircle the ponds and are 80-100 cm in length and 60 cm in depth. The fish ponds, designed to facilitate water flow, have a width ranging from 200 to 300 cm and a minimum depth of 80 cm. The rice fields are encircled by plastic mulch to enhance their efficiency. Farmers can simultaneously cultivate fish, vegetables, and fruits on the same land. This horticultural fish farming approach yields production levels that can be up to three times greater than those achieved through traditional rice-fish farming methods.

The rice fields are surrounded by plastic mulch. Farmers can cultivate fish, vegetables, and fruits on the same land, with horticultural fish farming production reaching up to three times that of traditional Rice-Fish Farming. This planting model optimizes land use, reduces fertilizer requirements by up to 50% as fish waste is natural fertilizer, and minimizes weed growth through mulch, with weeds also utilized as fish feed. The crops include chili peppers, cabbage, cucumbers, mustard greens, and red onions. Both construction methods can be used simultaneously to maximize agricultural land, especially for climbing or hanging horticultural plants.

During the COVID-19 pandemic, like many other regions, the community of Samberembe faced challenges in managing the Rice-Fish Farming Technopark due to social distancing restrictions, which hindered visits and on-site training. The implementation of social distancing measures forced the management to close the Rice-Fish Farming Technopark despite ongoing interest from various institutions. As a result, several assets deteriorated due to a lack of maintenance, including photo spots, public restrooms, fish therapy gardens, playgrounds, prayer rooms, and several gazebos. Additionally, many fish were infected with fungus, leading to crop failure. The development of horticultural plants and biofloc systems was also halted due to the resignation of the coordinators responsible for these areas.

In response, recovery efforts 2023 focused on strengthening human resources and repairing damaged assets. The contract with BSI Muamalat Bank was extended until 2026, and new initiatives for tourism development are planned. These efforts include expanding educational tourism under the Minapolitan concept, a comprehensive approach that integrates fisheries, aquaculture, agriculture, and tourism to boost local communities' economic, social, and environmental benefits. Additional plans involve enlarging the parking area, constructing huts, installing outbound equipment, and implementing a river exploration program.

Stakeholders involved in developing of the Rice-Fish Farming Technopark are categorized into internal and external groups. Internal stakeholders include community groups engaged in the management and empowerment of the project. In contrast, external stakeholders encompass government entities and other parties with interests or collaborations related to the project. The internal stakeholders include:

1. Ngudi Lestari Farmers' Group: This group is a crucial part of the integrated production system and collaborates closely with the rice farming group. They focus on applying best practices in rice cultivation, including seed selection, pest control, fertilization, and irrigation. Additionally, this group serves as an information center for tourists.
2. Mina Muda Fish Farming Group: This group, which comprises fish farming managers and practitioners, is involved in educational programs and development within the Rice-Fish Farming Technopark. They guide visitors and specialize in innovations in freshwater aquaculture, such as red tilapia and giant river prawns. They also provide information on fish farming techniques, innovations, and sustainable business practices.
3. Karang Taruna Dusun Samberembe: This group, consisting of youth and family heads, suppordts the management of the Rice-Fish Farming Technopark by promoting tourism through media, organizing community work, and preparing the land.
4. Mina Laras Mandiri Processing and Marketing Group: This group comprises women who process tilapia into various products, such as fermented fish (pepes), chips, and frozen foods. They also run catering services and street food businesses.
5. Women Farmers' Group: This group includes women engaged in educational activities at the Technopark, focusing on cultivating rice and horticultural crops.

Based on observations and interviews regarding the current situation, the researcher has identified these five groups as the Rice-Fish Farming Technopark management team for ease of reference in discussions, as no specific term or designation is conceptually applicable. Although each group

operates independently concerning production and profits, they collaborate in hosting visits by sharing tasks and roles. Meanwhile, external stakeholders or parties with interests outside the Rice-Fish Farming Technopark management include:

1. The Ministry of Marine Affairs and Fisheries of the Republic of Indonesia has significantly contributed to providing infrastructure and facilities for fish farming and processing. This support includes the provision of feed machinery for the self-sufficient feed program, bio floc aquaculture packages, frozen storage refrigerators, and water wheel machinery. Additionally, the ministry provides technical assistance and training.
2. The Department of Agriculture, Food, and Fisheries has supported the development of rice-fish farming agrotourism through assistance, legal validation of proposals, and creating a master plan for rice-fish farming.
3. Bank Rakyat Indonesia has approved the Credit for People's Businesses (KUR) application and allocated funds to maintain rice-fish farming assets.
4. Rumah Zakat, Laznas BSM, and Bank Mandiri Syariah have assisted in the development of seeds and infrastructure worth IDR 500,000,000.
5. Companies conducting product trials at the Technopark Rice-Fish Farming to assess the quality of specific varieties.

The importance of collaboration among stakeholders and the use of technology were also significant findings in this study. In this case, social media and digital platforms such as YouTube and Instagram were used to promote the success of Rice-Fish Farming, increase the visibility of the group, and facilitate access to information (Putra et al., 2016). This is in line with research by (Maudyakasih & Nuraeni, 2019), which emphasizes the importance of communication strategies in marketing agricultural businesses. However, this study provides evidence that technology also facilitates internal group management, accelerates information access between members, and supports more effective experiential learning.

Group Dynamics Strategies in the Management System of Technopark Rice-Fish Farming

Group dynamics strategies vary depending on context. In the Technopark Rice-Fish Farming management, key approaches include effective communication, task and role distribution, decision-making, conflict resolution, and group development. The management comprises five groups: Ngudi Lestari Agriculture Group, Mina Muda Fisheries Group, Karang Taruna, Mina Laras Mandiri Management and Marketing Group, and Wanita Tani Samberembe Group. Each group is led by an elected representative responsible for task coordination and internal organization. These leadership roles support efficient task allocation and adapt to evolving group responsibilities. All groups collaborate and participate actively in rice-fish farming activities. The following outlines essential strategies used to sustain positive intergroup relations and effective management:

1. Maintaining Vision and Innovation

   Since 2012, Technopark Rice Fish Farming has promoted education, innovation, and sustainability through integrated rice–fish systems that reduce pesticide use and enhance soil fertility. It also supports local product development via Poklahsar and Wanita Tani Groups. Key innovations include smart irrigation, water retention dams, and water-level sensors to improve drought resilience. Despite challenges in trials like biofloc systems and prawn cultivation, the program remains committed to improvement and has secured external research funding.

   In the past year, Technopark introduced the Minapolitan educational concept, integrating experiential learning with aquaculture. Visitors learn fish identification, handling, pond management, and ecosystem conservation, blending education with sustainability promotion.

   This study reveals that rotational task sharing enhances internal communication, collaboration, and shared responsibility. Unlike prior studies emphasizing fixed roles (Prasetyo et al., 2019; Rusydi & Rusli, 2022), this approach strengthens group solidarity. For instance, in contrast to Firnando et al. (2022), who focused on centralized structures, Technopark empowers members through dynamic role distribution.

   Interpersonal communication also supports program continuity, echoing earlier findings (Pamungkas & Khotimah, 2022; Ramli et al., 2023). However, this study highlights the added value of external communication with mentors and visitors. Mina Muda, for example, provides

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training, while other groups manage logistics—together ensuring operational sustainability and Technopark's long-term impact.

2. Effective Communication and Decision-Making

   Effective communication at Technopark Rice-Fish Farming supports participatory decision-making. Management and team members coordinate through WhatsApp and scheduled meetings to evaluate activities and implement innovations. Decision-making is guided by shared norms that promote open dialogue, active listening, and collaborative learning. While most members are engaged, some are less involved but still show strong commitment to group outcomes.

   When conflicts or management issues arise, they are reported directly to administrators, who serve as mediators to resolve them efficiently. WhatsApp is also used as a real-time platform to share updates on land conditions, rice growth, harvest schedules, and fish health. A logbook documents daily activities, challenges, harvest results, and visitor schedules to ensure transparency and accountability.

   Regular meetings also address external support from the government, companies, and financial institutions, including subsidies, fertilizers, and seedlings that help improve productivity and lower costs. Companies are invited to test new products on-site. At the same time, the government promotes Technopark as an educational tourism destination and supports it through technology transfer and the publication of success reports to guide future policy.

   Vertical communication between managers and stakeholders takes place through periodic reporting, regular meetings held every three to six months, and continued updates via WhatsApp. Karang Taruna, a key group involved, also manages public communication through social media. Their platforms, @KampungMinaPadi on YouTube and @kampungminapadisamberembe on Instagram, provide updates on farm expansion, infrastructure development, and promotional efforts. These efforts build a strong, reciprocal relationship with the wider community.

   This integrated communication system, based on collaboration and shared commitment, ensures the sustainability and collective benefit of Technopark Rice-Fish Farming.

3. Task and Role Distribution

   Roles and responsibilities within Technopark Rice-Fish Farming are equitably distributed through a rotational system, promoting balanced participation across groups and preventing task overload. Ngudi Lestari mentors introduce visitors to the jajar legowo method, the fisheries group leads site tours, while the processing and marketing group handles hospitality and souvenir preparation. The farming group prepares demonstration sites and explains daily practices and challenges, while the management team oversees scheduling, logistics, training materials, and tour planning.

   This collaborative model benefits all groups involved. Farming and fisheries teams gain improved market access through established networks, while the management team ensures price stability to strengthen the local supply chain. PokLahSar also contributes by processing and marketing fish products, supporting the economic viability of the system and maintaining operational dynamism.

   A key finding of this study is the sustainability of a farming system jointly managed by small, semi-autonomous groups under a unified framework. Although each group has its own objectives, they remain interdependent, relying on shared management structures and resources. This dynamic aligns with Homans' social exchange theory, which posits that cooperation and stability are maintained through reciprocal benefits. The structure demonstrates how intergroup collaboration can enhance member welfare while securing the long-term viability of integrated farming practices.

   Theoretically, this study contributes to the understanding of group dynamics in integrated farming systems by highlighting rotational task sharing and digital technology as key success factors. Practically, these strategies can inform the development of sustainable models across various contexts, such as agroforestry and aquaponics.

   For example, role rotation can increase engagement in farmer groups, as seen in organic farming initiatives in West Java (Putra et al., 2016). Likewise, the digital strategies used in Technopark Rice-Fish Farming offer a replicable model for enhancing information flow and market access. These findings are applicable to other integrated farming systems, both locally and globally. Roles and responsibilities within.

4. Conflict Resolution

   Technopark Rice-Fish Farming has faced many issues for more than a decade. However, this study will focus on issues from the last five years, excluding technical problems.

   a) Internal Conflicts

      Candibinangun village initially had three rice-fish farming areas organized by hamlets: Dusun Kemput, Dusun Kumendang, and Dusun Samberembe. Due to conflicting visions and leadership issues, Dusun Kemput and Dusun Kumendang are no longer actively involved. Members from these hamlets either left or joined Dusun Samberembe. Since 2019, Dusun Samberembe, now known as the Technopark Rice-Fish Farming Management Team, has embraced the motto *"Bumregah lan Nyawiji"* (rise and unite) and expanded its focus to include collaboration with other groups. This shift introduces both new challenges and opportunities for Technopark Rice-Fish Farming.

   b) Impact of Social Distancing and Self-Isolation During the COVID-19 Pandemic

      The implementation of social distancing and self-isolation during the COVID-19 pandemic forced the closure of Technopark Rice-Fish Farming, halting visits, marketing activities, and daily operations. Facilities such as the angkringan and photo spots deteriorated due to inactivity, and MSME exhibitions and agricultural showcases were suspended. Although the initiative attempted a shift to digital marketing, limited resources posed challenges. As visits and exhibitions were key tourist attractions, their absence significantly impacted engagement. Nonetheless, the Technopark adapted by conducting online learning sessions, which were shared via YouTube.

   c) Drought

      One major challenge is drought, which affects nearly three-quarters of the agricultural area that requires water for fish ponds. This issue has occurred multiple times and significantly impacts production. Technopark Rice-Fish Farming depends on rainwater and river water sourced from Mount Merapi. However, the government-regulated dam opening and closing system sometimes causes the flow through RW3 (neighborhood unit) to dry up. To address this issue, a new dam is under construction, and a terraced rice field system is being implemented to provide a consistent water supply across all areas. This solution is being coordinated with the village government.

   d) Vacancy of Area Managers

      Task distribution at Technopark Rice-Fish Farming is structured to optimize area management. Maintenance may be compromised due to vacancies, resulting in diminished land management and crop failures caused by pests and diseases. An activity schedule and monitoring system are established to mitigate these issues, assigning each member responsibility for two areas until new recruits are appointed.

In conclusion, this research provides novel insights into the challenges and opportunities faced in managing group dynamics in integrated farming systems, as well as highlighting the importance of effective communication, dynamic division of roles and use of technology for the sustainability of such systems. The implications of these findings are broad, with substantial contributions to the advancement of sustainable farming practices, both in Indonesia and globally.

CONCLUSION

The study concluded that the successful management of Technopark Rice-Fish Farming is supported by three main pillars: group collaboration, technology utilization, and external stakeholder support. Collaboration through task rotation between groups increases solidarity, active involvement, and a sense of shared responsibility in overcoming challenges. The utilization of innovative technologies, such as automatic irrigation and app-based monitoring systems, improves management efficiency and maintains crop quality. Stakeholder support, including government, financial institutions and educational institutions, contributes in the form of funding, training and supporting facilities. The implications of this research emphasize the importance of policies that encourage group-based farming systems with task rotation, technology integration, and cross-sector collaboration. The government and stakeholders are expected to facilitate training and access to technology for farmer groups to realize more effective, efficient and sustainable agriculture.

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