

CHALLENGES AND THE OPPORTUNITIES OF COMMUNITY-BASED INNOVATION IN INDONESIA

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ABSTRACT

The research examined the challenges and opportunities of community-based innovation in Indonesia by conducting a case study in the Petani Muda Keren (PMK) Bali Community, a pilot community for innovative farming development in Bali province. In addition, the research also provided a knowledge transfer mechanism in the community to explore how innovation diffusion happens in the community. As a group of people with a common interest and mission, a farmer's community could be an effective place for innovation diffusion by offering emotional support to handle psychosocial issues. Moreover, it could construct its members' perceptions of technology through social shaping processes. A qualitative case study was applied in the research to explore community-based innovation in Indonesia's agriculture that highlighted Petani Muda Keren Bali Community. Through observation and in-depth interviews with the community founder and twenty farmers from five regions in Bali, the current research indicates challenges and opportunities of community-based innovation in Indonesia related to several issues, including innovation rate and farmers' readiness, the perception gap between young and elderly farmer, the inconsistency of young members, and government support and policies to the community.

Keywords: community-based innovation, farming development, Petani Muda Keren Bali Community

INTRODUCTION

Indonesia is one of the largest agrarian countries in Southeast Asia, with an area of 1.905 million km², with the majority of the population working in the agricultural sector. The Central Statistics Agency (BPS, 2020) has stated that the number of Indonesians working as of August 2020 was 128,45 million people. Of this figure, 38,23 million workers, or around 29,76%, work in the agricultural sector. However, agricultural productivity in Indonesia is still lagging behind compared to neighboring countries such as Thailand. According to the World Bank, in 2017, there were 570.000 square kilometers of productive agricultural land in Indonesia. However, agricultural productivity in Indonesia is still lower than in Thailand. Thailand, whose agricultural land area is much smaller than Indonesia, is able to maximize its agricultural output up to 50 times larger than agriculture in Indonesia. Therefore, the government, through the Minister

of Agriculture Regulation number: 02/Permentan/LB.200/2/2018, concerning guidelines for the transfer of agricultural technology to increase agricultural productivity in Indonesia by accelerating the spread of innovation. This policy is supported by Rose et al. (2021), which have mentioned that evolving technologies such as artificial intelligence, robotics, big data, the Internet of Things, genetic manipulation, and drones can significantly boost agriculture productivity. This technological revolution in the agricultural sector strengthens the benefits of agriculture to people and the planet.

A farmer's community can be an effective place for technology diffusion as a group of people who share a common interest and mission. Community organizations can provide emotional supports to address psychosocial problems that complement the adoption processes (Warner et al., 2021). In addition, user-innovators are more inclined to offer or unveil their innovations to other users or even

new entrants with the same interest (Pongtanalert & Ogawa, 2015). Moreover, the community can shape its members' perceptions of technology through social shaping processes (Tsai, Wang, & Chen, 2021; Warner et al., 2021). Social shaping processes shape individual perception and socialization in terms of learning, compliance, and confidence-building (Tsai, Wang, & Chen, 2021). Generally, it can improve the likelihood of new technology uptake (de Witt et al., 2021). Therefore, it is essential to take a broad view of community-based innovation in technology adoption processes.

Community-based innovation is defined as, "organizations, directly and indirectly, involved in the commercialization of new technology" (Lynn, Reddy, & Aram, 1996). It alters positive change in the community, particularly among its most vulnerable member (Daou, 2017; Pongtanalert & Ogawa, 2015; Kranich & Krannich, 2010). Wang and Liu (2021) have highlighted that community knowledge variety ultimately affects innovation, and community network position has a moderating consequence on the connection among community members. In addition, according to Seidel, Langner, and Sims (2017), the type of community influences the ability of innovation dispersal among its fellows. They argue that self-organized communities deliver the overall most elevated fit to innovation factors. It encloses decision privileges that promote them to decide where to search for widely dispersed knowledge. Self-organized communities define as those that generally arise unassisted from corporation activity. These communities usually supervise themselves, arranging and embellishing their rules and norms of participation (Seidel, Langner, & Sims, 2017).

Self-organized communities in agriculture have developed a lot in Indonesia, one of which is widespread as the Subak organization in Bali. It emerges to develop agriculture, especially inland irrigation (Pemerintah Kabupaten Buleleng, 2021). Besides that, the government has also facilitated innovation in the agricultural sector by establishing P4S (Agricultural and Rural Self-Help Training Centers) to increase networking (*silaturahmi*) between P4S throughout Indonesia, directing member aspirations (P4S) to the government and assisting the government in developing P4S throughout Indonesia (BPPSDMP Pertanian, 2021). However, the adoption rate of modern agricultural technology by smallholder farmers in Indonesia remains low. Technology attributes, farmer or farm household characteristics, farm characteristics, and institutional factors are the four major typologies of determinant factors to explain low adoption rates of agricultural technology in developing countries (Suprehatin, 2021). Apart from these four factors, Shang et al. (2021) have assessed two more factors in technology adoption among farmers: interactions and psychological factors.

The research aims to examine opportunities and challenges of community-based innovation implementation in Indonesia's agriculture system.

A case study is conducted in Petani Muda Keren (PMK) Bali Community to fully comprehend the opportunities and challenges of community-based innovation in Indonesia's agriculture system by exploring the research questions: (1) What are current issues of community-based innovation in Indonesia's agricultural system? (2) What are the opportunities and challenges of community-based innovation in Indonesia? (3) How do knowledge transfers and innovation happen inside the community?

METHODS

A qualitative case study is applied in the research to explore community-based innovation in Indonesia's agriculture. For the qualitative case study, it highlights Petani Muda Keren Bali Community. It is because Petani Muda Keren Bali is one of the agricultural communities in Bali that was established in 2018 and has members spread throughout the province of Bali. Even though it is not even three years old, this community is recorded to have more than 300 members who are divided into 12 Pusat Pelatihan Pertanian dan Perdesaan Swadaya (P4S). The age range of members of this community also varies from 20 to 80 years old. Additionally, this is also a pilot community for smart farming development in Bali province. This community has a digital platform called BOS (Bali Organik Subak). BOS is a digital platform managing agricultural activities from downstream to upstream that consists of two mobile applications, BOS Farmers and BOS Fresh. BOS Farmers is designed for the farmers to manage downstream activity. In the application, farmers can fill in information about the commodities planted, planting schedule, plant age, land area, and the number of plants. With an algorithm, farmers then get information on when to harvest, the estimated number of harvests, and the time of fertilization. BOS Fresh is designed for marketing the product and distributing it to the customer. The vision of this community is to produce organic products, encourage farmers to live healthily, and build sustainable businesses. The community has experts called 'champion' in each agricultural product. A 'champion' is a person who specializes in certain agricultural fields. This community is one of the active communities in Bali and is often visited by other agricultural communities in Indonesia to share knowledge.

Data collection is conducted with observation and in-depth interviews with the founder of Petani Muda Keren Bali Community and 20 farmers who come from different areas with various commodity backgrounds and ages. Data collection is conducted from February 2021 until November 2021. During this interval, the researchers visit five areas with the highest members, namely Karangasem, Buleleng, Bangli, Gianyar, and Jembrana. Table 1 shows the distribution of areas, commodities, and ages of the interviewees.

Observation focuses on using and developing agricultural digital technology and smart farming among members of the Petani Muda Keren Bali Community. The focus in in-depth interviews is directed at three-question domains: the current issue of invention in agriculture, knowledge transfer, and the opportunities and challenges of inventing innovation.

Table 1 Interviewees' Profile

Age	Area	Commodity	Participants
50 - 53	Bangli	Citrus	2
20 - 50	Buleleng	Vanilla, Horticulture	7
30 - 60	Gianyar	Papaya, Durian, Horticulture	3
30 - 50	Jembrana	Cocoa	2
20 - 60	Karangasem	Horticulture	8

By conducting interviews with the founder and 20 Petani Muda Keren Bali members, the researchers want to answer the following: (1) What are the current issues of community-based innovation in Indonesia's agricultural system? (2) What are the opportunities and challenges of community-based innovation in Indonesia? (3) How do knowledge transfers and innovation happen inside the community?

RESULTS AND DISCUSSIONS

The researchers conduct the first observation and in-depth interview by visiting the Petani Muda Keren Bali Community founder. He explains that this community is born from problems in agriculture. The community also emerges as a movement to invite the younger generation to get concerned in agriculture and educate farmers to take advantage of technology.

"...As the name implies, Petani Muda Keren, we invite young people to farm through this community by utilizing agricultural mechanization, smart farming with IoT, and marketing opportunities to export their products. For me, the biggest problem in the agriculture field is unsustainable agricultural activities. There is no interrelationship among the actors. Therefore, I am trying to build an integrated 'value chain' from upstream to downstream by combining IT/technology, culture, local wisdom, and agriculture...." (Interview, founder of Petani Muda Keren Bali community).

After visiting him, observation and in-depth interviews are continued by visiting Petani Muda Keren Bali members. After considering distance and time, Petani Muda Keren Bali's founder suggests taking samples from five districts with the immense majority

of members and the rapid development of technology adoption, namely Bangli, Buleleng, Gianyar, Jembrana, and Karangasem. After observation and in-depth interviews, the researchers discover several issues in community-based innovation that often arose during interviews.

The first is the innovation rate and farmers' readiness in the community. The innovation rate is defined as the speed at which technological innovation or advancement occurs. Farmers' readiness is related to resources (financial, physical, human, social, political, natural, or cultural) required to realize their desire to implement an innovation. As mentioned by Handayati, Simatupang, and Perdana (2015) and Myeni et al. (2021), farmers in developing countries consist of smallholder farmers who are limited in capital and knowledge of modern technologies.

"I have the BOS farmer application on my smartphone, but I haven't utilized it. Apart from the age factor, the condition of agriculture here, which is still not connected to IoT, makes me reluctant to use it, and it is not a must in the community. The problem is that the IoT-integrated system is also expensive, right? So, we communicate via WhatsApp group if there is a problem we also discuss it through WhatsApp." (Interview, middle-aged farmer)

According to the statement, even middle-aged farmers are not ready to digitize and implement smart farming because of age and financial constraints. Additionally, the Agricultural Human Resources Extension and Development Agency (BPPSDMP) of the Ministry of Agriculture has said that only about 8% of total farmers are young. The remaining more than 90% are colonial farmers or old farmers. This affects the capacity of farmers to absorb and develop new technologies.

The second issue is the perception gap between young and elderly farmers. Although the community has tried to educate farmers and promote innovation, the rate among the community is still relatively low. It happens because of an unbalanced distribution between the readiness of farmers to innovate, especially digital technology and smart farming. Besides resources and capability, the age factor and innovation perception also affect the readiness of farmers to innovate.

".. innovation in agriculture is swift. Innovation is not only in product management but also in land development and cropping patterns. It will also be problematic if we want to adopt the whole technology. Actually, I'm not really ready for this digital transformation. For me now, the most important thing is to create agricultural products of good quality. So I think, for now, digitalization is not critical. Therefore, I focus more on farming and cropping techniques. Other than that, using a digital platform like BOS Farmer tends to be tricky for my age

because we have to learn from blemishes which take time...” (Interview, elderly farmer).

Elderly farmers tend to have different views on innovation. They assume that innovation is only limited to the aspect of technology application, and their view does not include the sustainability advantages that technology can construct through big data and cloud computing. Therefore, they tend to put aside aspects of digitalization in their agricultural development. In contrast to elderly farmers, young and middle-aged farmers are very enthusiastic about agricultural digital innovations development.

“.. From my point of view, digitalization and intelligent farming require a significant capital investment in the initial process. But the impact on the effectiveness of production is tremendous. Furthermore, specifically for the digital platform (BOS farmer), I think it’s important to adopt it and use it actively. Besides providing production forecasts and financial needs, the data we input can later become a source of information to determine the expected supply for downstream parties...” (Interview, young farmer)

The way the young generation perceives technology is more holistic and systemic than the elderly generation because they understand the value of data. These two perceptions from different generations have created a high readiness gap in developing innovation in the agricultural sector, especially for digital technology and smart farming. Therefore, spreading innovation evenly among members becomes quite a challenge for the community because they have to be able to revise the perception of elderly farmers regarding technological innovation and its benefit.

The inconsistency of young members is the third issue faced by the community. Young farming community members tend to be volatile, do not enjoy the process, and want instant results. This character also makes them often move from one commodity to another agricultural commodity. The frequency of frequent shifts will lengthen their distance to succeed. It causes the younger generation to find it challenging to survive in the agricultural world, which is full of uncertainty because it is very dependent on external factors that cannot be controlled, such as climate. From this issue, it can be seen that the development of innovation in the community is very challenging because the challenges of the community not only change the perception of elderly farmers but also cultivate the persistent character of the young generation.

“... The current generation always wants instant results; it is hard to be consistent and easy to get carried away. They like to explore, but it is rare for the younger generation to want to pursue a field, especially agriculture.” (Interview, PMKs’ founder)

The fourth is government support and policies for the community. Government support is limited to connecting the community with investors and increasing community exposure. This form of support tends to increase community recognition in the national sphere, but most community members cannot feel the benefits directly. Additionally, it may ease the burden of the community, but still, they need to struggle to get investors in their agricultural innovation development.

“... yesterday, the community representatives were invited to an event at the ministry of agriculture and directly attended by the minister of agriculture. They were very interested in our digitization and mechanization program and demanded that we increase the land using digitization and mechanization. However, it has not been provided in terms of funding, and the ministry only connects us to investors.” (Interview, farmer)

In addition, the government has not promoted policies regarding community-based innovation and programs targeting community development, especially in agricultural communities. It forces the community to struggle and go through all the challenges of developing innovation independently.

“So far, the government’s role in community development is minimal, and we don’t feel the impact. The government’s role is only limited to making visits, listening to our problem, and not taking genuine action to solve the problems so far.” (Interview, PMKs’ founder).

As aforementioned, many community issues are related to the development of community-based innovation. These issues ultimately create challenges and opportunities for the development of community-based innovation. The first challenge is changing the innovative perception of elderly farming. This process, of course, requires a lot of time and effort.

“...changing one’s perception of something is quite difficult, isn’t it. Moreover, the perception is already embedded in their minds. So changing the perception of elderly farmers is quite difficult in the community, and educating them does not seem enough.” (Interview, PMKs’ founder)

The second challenge is to form the persistent character of the young members. It can be formed through supervision in the community, seminars, and farmers’ camp programs that the community has launched. The challenge to form a strong and resilient ‘farmer’ character in the younger generation can be seen as an opportunity for development by the community. With this challenge, the community can become more creative, following the times and the development of generations. It will gradually develop a community that is agile and keen to change.

Limited government support and policies become the third challenge of community-based innovation. Government support and policies are needed to increase the rate of innovation development in the community, especially financial support. Although the community can develop independently, it is undeniable that financial constraints make the spread of innovation uneven and impact the low rate of innovation development.

In addition to the community's challenges in developing innovation, the drivers of community-based innovation can survive because they see the opportunities created by its development. First, community-based innovation can increase innovation diffusion among farmers through knowledge transfer within the community. Second, community-based innovation increases the opportunity to develop digitally integrated agricultural value chains from downstream to upstream through the minor community environment. Third, community-based innovation is seen as a movement to encourage farmers to farm by utilizing technology. Fourth, this community-based innovation can engage many people to join the agricultural sector by networking with its members. Fifth, the existence of an innovation-based community helps the development of human capital in agriculture through seminars and supervision provided. Furthermore, the last, community-based innovation, can be a learning platform for novice farmers and the younger generation who want to enter the agriculture field through community-driven innovation programs such as the farmers' camp program in Petani Muda Keren Community.

Besides the issue of community-based innovation, the knowledge transfer in the Petani Muda Keren Community is also very insightful, and it can be developed by other agricultural communities. Knowledge transfer is an essential factor in innovation studies, especially in the community. Research conducted by Rogers, Singhal, and Quinlan (2019) has examined that knowledge and information transfer occur more easily in groups with similar backgrounds and visions. Knowledge transfer is becoming highly significant as a foundation for innovation and

development (Wehn & Montalvo, 2018).

To boost the growth of innovation in the community, Petani Muda Keren Bali held regular agricultural seminars every month to spread innovations in agriculture. Moreover, they also form a group of farmers with expertise in specific fields. They called them 'champions'. These 'champions' will later provide counseling and share their knowledge about farming procedures from pre-harvest and post-harvest. As Wang and Shi (2019) have stated, this supervision mechanism is an essential tool for increasing the effectiveness of knowledge sharing, and this mechanism has been working well so far. The supervision mechanism applied by the Petani Muda Keren Bali Farmers is shown in Figure 1.

Figure 1 shows the flow of information and the supervision mechanism on the digital platform device developed by the Petani Muda Keren Bali Community. However, according to most interviewees, informal information sharing is more common via WhatsApp. Besides being more accessible and familiar to use, the response that farmers get is also faster. The knowledge they get through the cooperative is usually from tacit knowledge about how to create competitive advantages in their agricultural products. With a good relationship and control management between farmers and cooperatives, it is easier for improvement and innovation to occur among farmers. One of the interviewees reveals that this supervision mechanism increases trust between the two parties, increasing transparency in the agricultural supply chain. In addition to initiatives from several communities to build their experts, the government has established the Agency for Extension and Development of Agricultural Human Resources. This institution carries out two functions, namely economic and educational functions. Programs on the economic function are programs to improve agricultural extension and training. At the same time, the educational function program is agricultural education. However, research by Hamadal and Adil (2019) has indicated that the role and function of plantation agricultural extension institutions in agricultural development are still not optimal.

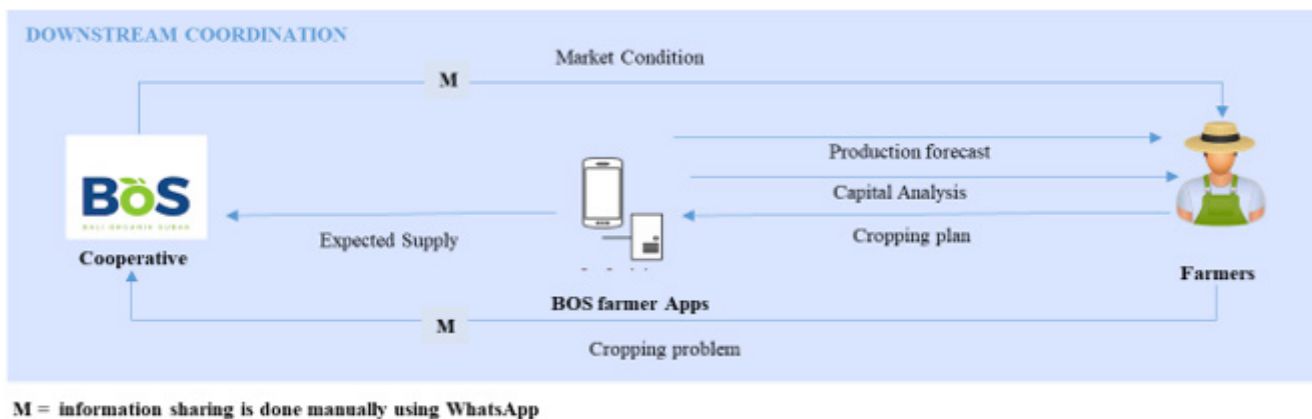


Figure 1 Supervision Mechanism Petani Muda Keren Bali Community

CONCLUSIONS

Utilizing the agricultural community as a platform for developing agriculture innovation can benefit both farmers and the government. As a group of people with a common interest and mission, a farmer's community can be an effective place for technology diffusion. Community organizations can offer emotional support to handle psychosocial issues during adoption. Unfortunately, the implementation of this community-based innovation encounters many challenges. Therefore, the current research wants to assess the challenges and opportunities of community-based innovation. In addition, it also examines how knowledge transfer occurs among farmers in the community to provide an overview of how the diffusion of innovation occurs.

The research contributes to the development of community-based innovation literature. The results also remind the government or policymaker of the role of the farmers' community as an innovation platform in the agricultural sector. The research is limited to implementing a case study, the Petani Muda Keren Bali Community. Therefore, the researchers invite other researchers to take future research directions to add more case studies and compile and compare them. So the data become more affluent and comprehensive.

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