

Enhancing Farmers' Knowledge through Extension on the Jajar Legowo Planting System in Rainfed Rice Field Cultivation in Wangka Village, Ngada Regency

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Abstract: Rice is a major food commodity that plays a strategic role in supporting national food security. However, rice productivity in rain-fed paddy fields still faces various challenges, including dependence on rainfall, high weed growth, and pest infestations, which prevent yields from reaching their full potential. This community service activity aims to enhance farmers' knowledge of rain-fed paddy cultivation through the implementation of the jajar legowo planting system. The activity was conducted on May 7–11, 2026, in Wangka Village, Ngada Regency, involving 50 farmers and students from the Agricultural Science Program at the National Institute of Flores. The activity employed a Participatory Action Research (PAR) approach through the following stages: problem identification, extension sessions, participatory discussions, question-and-answer sessions, and activity evaluation. Evaluation was conducted through observation of participant engagement, discussions, and interviews regarding farmers' understanding and readiness to implement the introduced technology. The results of the community service activity showed that participants enthusiastically took part in the event and actively discussed various issues related to rain-fed paddy cultivation. The extension session successfully improved farmers' understanding of the benefits of the jajar legowo planting system, particularly regarding planting spacing, weed control, and the management of plant pests and diseases. In addition, more than 85% of farmers expressed their readiness to adopt the legowo planting system in the next growing season, indicating a high level of acceptance of the introduced technology. This initiative has helped to build farmers' capacity and serves as a first step toward promoting the adoption of more effective and sustainable rice cultivation technologies on rain-fed paddy fields.

Keywords: Rice cultivation; jajar legowo; agricultural extension; rain-fed rice fields; farmer empowerment.

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INTRODUCTION

Rice is a strategic food commodity that plays a vital role in supporting national food security. Efforts to increase rice production depend not only on the use of high-yielding varieties but also on the application of cultivation technologies that can improve land-use efficiency and crop productivity. One of the challenges in rice cultivation in Indonesia is the management of rain-fed rice fields, which are highly dependent on rainfall and therefore tend to have lower productivity compared to irrigated fields. In addition to limited water availability, farmers also face problems such as heavy weed growth, poor air circulation, and pest and disease infestations that can reduce crop yields. Therefore, there is a need for cultivation technologies that are easy for farmers to implement and capable of improving the efficiency of crop management.

One widely recommended innovation in rice cultivation is the *jajar legowo* planting system, a planting pattern that adjusts the spacing between rows so that each plant clump receives better growing space and light intensity. This system has been proven to increase plant population, improve air circulation, facilitate crop maintenance, and enhance the effectiveness of weed and pest control. Various studies report that the application of the *jajar legowo* system can improve rice plant growth and yield compared to conventional planting systems, especially when adapted to local agroecosystem conditions (Rachman *et al.*, 2022; Suryanto *et al.*, 2023). Therefore, the *jajar legowo* planting system is a promising cultivation technology for application in rain-fed rice fields.

Based on preliminary observations and discussions with farmers in Wangka Village, Ngada Regency, most farmers still use conventional planting patterns with irregular planting distances, resulting in suboptimal crop management. In addition, farmers still face challenges in weed control, plant population management, and the efficient use of planting space. These conditions indicate that farmers' understanding of the *jajar legowo* planting system still needs to be improved so that this technology can be adopted in accordance with the conditions of rain-fed paddy fields. Therefore, extension services are an important strategy for enhancing farmers' capacity to both understand and implement rice cultivation innovations.

Various community service activities have shown that extension programs combined with participatory discussions and mentoring can enhance the community's knowledge and readiness to adopt appropriate technologies (Matonda *et al.*, 2026; Kadju & Timang, 2026). In the agricultural sector, extension activities regarding cultivation technologies generally focus on delivering technical material but remain limited in evaluating farmers' readiness to adopt the introduced innovations. Therefore, this community service initiative introduces a novel approach: the implementation of participatory extension on the *jajar legowo* planting system for rain-fed rice farmers, combined with an evaluation of farmers' understanding and readiness to adopt this technology as part of community capacity building.

Given these conditions, this community service initiative aims to enhance farmers' knowledge and readiness in implementing the *jajar legowo* planting system for rain-fed paddy cultivation in Wangka Village, Ngada Regency. Through extension activities, discussions, and mentoring, it is hoped that farmers will be able to understand the benefits of the *jajar legowo* planting system and be encouraged to implement it in their rice cultivation practices to support increased farming efficiency and sustainable food production.

METHOD

The community service activity was conducted on May 7–11, 2026, in Wangka Village, Ngada Regency, with 50 rain-fed paddy farmers participating. The location was selected based on preliminary observations indicating that most farmers still used conventional planting

systems and did not yet fully understand the application of the jajar legowo planting system as a rice cultivation technology. This activity employed a Participatory Action Research (PAR) approach, which positions the community as active partners throughout the entire process—from problem identification and solution development to the delivery of extension services and evaluation of the activity's outcomes. This approach was chosen to ensure that the material provided aligns with the farmers' needs and increases the likelihood of sustainable technology adoption.

The initial phase of the project began with identifying issues through field observations and discussions with farmers regarding the rice cultivation systems they had been using, challenges in managing rain-fed rice fields, and the farmers' level of understanding of the jajar legowo planting system. Based on the results of this identification, an extension session was conducted on the concept of the jajar legowo planting system, the principles of spacing, benefits for plant growth, weed control, pest and disease management, and the potential for improving rice cultivation efficiency. The extension session was followed by an interactive discussion and Q&A session so that participants could raise various issues they faced in rice cultivation practices in the field.

Throughout the program, the community service team provided guidance to ensure participants understood the material presented and were able to apply the concepts of the jajar legowo planting system to the conditions of rain-fed rice fields in Wangka Village. This guidance was provided through group discussions, technical consultations, and demonstrations of how to apply the jajar legowo planting system in accordance with local conditions. This participatory approach gave farmers the opportunity to share their experiences while also finding solutions tailored to their needs.

The activity evaluation was conducted to assess the extent to which the program's objectives were achieved in terms of farmer participation, understanding, and readiness to adopt the jajar legowo planting system. The evaluation was carried out through observations during the activity, discussions, and interviews with participants regarding their understanding of the material and their plans to apply the technology in the next planting season. Participants' level of participation was assessed based on their engagement in extension sessions and discussions, while their readiness to adopt the technology was measured through their statements regarding their willingness to implement the jajar legowo planting system. The results of this evaluation were used as the basis for assessing the effectiveness of the community service activities in enhancing farmers' capacity.

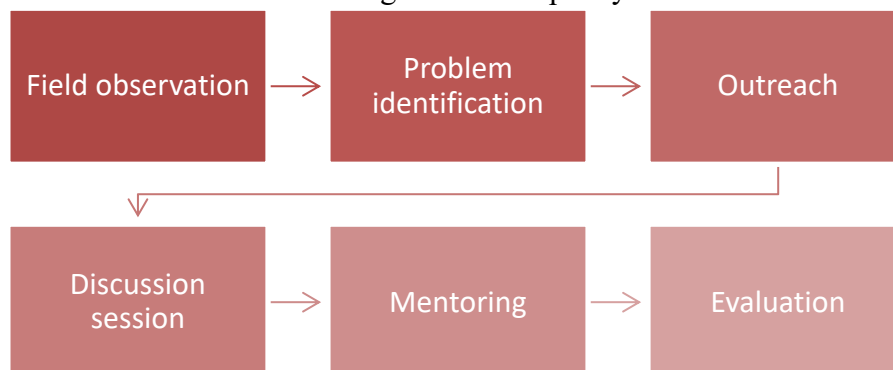


Figure 1. Steps for conducting training on the legowo planting system.

RESULTS AND DISCUSSION

Implementation of Training on Silage Technology Using Kinggrass Forage and Rice Straw

The community service activity was held in Wangka Village, Ngada Regency, with 50 rain-fed paddy farmers participating. The activity began with an educational session on the importance of implementing the *jajar legowo* planting system as an innovative rice cultivation method capable of improving the efficiency of crop management in rain-fed paddy fields. The material presented covered the basic principles of the *jajar legowo* planting system, planting spacing, its benefits for plant growth, weed management, pest and disease control, and opportunities to improve rice cultivation efficiency. The material was presented in a communicative manner, tailored to the farmers' characteristics and experiences, so that participants could more easily understand the concepts introduced.

Based on the results of initial observations and discussions with participants, it was found that most farmers still use conventional planting systems involving the broadcasting method or irregular planting distances. This planting pattern is chosen because it is considered simpler and has been practiced for generations. However, farmers also mentioned various challenges they face, including relatively high weed growth, difficulties with weeding and fertilization, and an increased risk of pest infestations due to overly dense plant canopies. These conditions indicate that farmers are actually aware of the various problems with their current farming system but have not yet found alternative technologies that are easy to understand and suitable for rain-fed rice fields.

The extension program utilized the Participatory Action Research (PAR) approach, which positions farmers as active partners throughout the entire learning process. Throughout the activities, participants not only received materials from the implementation team but were also given the opportunity to share their experiences, identify the farming challenges they faced, and collectively discuss various alternative solutions. This participatory approach fosters a more interactive learning process by integrating scientific knowledge with farmers' practical experiences. According to Baum *et al.* (2006), the PAR approach can increase a sense of ownership of the innovations introduced because the community is actively involved from the problem-identification stage through to the evaluation of the activities. This view is reinforced by Cornish *et al.* (2023), who state that community involvement in every stage of the activities is a key factor in enhancing the success and sustainability of empowerment programs.

Throughout the extension session, the participants showed a high level of enthusiasm. Farmers actively asked questions about planting spacing, the number of seedlings per planting hole, weeding techniques, and the feasibility of applying the *jajar legowo* planting system under different soil conditions. This high level of participation indicates that the material presented addressed the real-world needs farmers face in the field. These findings align with the community outreach activities reported by Matonda *et al.* (2026), which demonstrated that delivering appropriate technologies through a participatory approach can enhance community acceptance of the introduced innovations. Similar findings were also reported by Kadju and Timang (2026), who stated that a combination of extension sessions, discussions, and active participant engagement can enhance the effectiveness of knowledge transfer while encouraging the community to be more open to adopting new technologies. Therefore, the participatory extension approach implemented in this activity serves as a crucial foundation for building farmers' readiness to adopt the *jajar legowo* planting system in the next growing season.



Figure 2. A training session on the legowo planting system was conducted for rain-fed paddy farmers in Wangka Village, followed by an interactive discussion on rice cultivation issues and alternative technologies.

Improving Farmers' Knowledge and Readiness in Implementing the Jajar Legowo Planting System

One of the main objectives of this community service activity was to improve farmers' knowledge regarding the application of the jajar legowo planting system in rain-fed paddy cultivation. Throughout the extension session, participants demonstrated excellent engagement, as evidenced by their active participation in following the material, asking questions, and discussing various challenges they faced during the rice cultivation process. The participants' enthusiasm indicates that the material presented met the farmers' needs and addressed the various problems they have long faced in the field. The extension activities, combined with interactive discussions, provided farmers with the opportunity to connect the material they received with their real-world experiences, making the learning process more meaningful and contextually relevant.

To assess the effectiveness of the activity, an evaluation was conducted through observation, discussions, and interviews with all participants after the extension activity was completed. The evaluation focused on the participants' level of participation during the activity and the farmers' readiness to implement the jajar legowo planting system in the next growing season. The evaluation results showed that all participants attended the activity until its conclusion and actively participated in the discussion sessions. In addition, more than 85% of farmers stated they were ready to implement the jajar legowo planting system as an alternative cultivation technology on rain-fed rice fields. The results of the activity evaluation are presented in Table 1.

Table 1. Evaluation Results of the Jajar Legowo Planting System

Evaluation aspect	Results
Participants who completed the activity	100%
Participants who actively participant discussions	> 75%
Participants who are ready to implement the jajar legowo planting system	> 85%

The results of the evaluation show that the community service activities not only succeeded in increasing participants' knowledge but also built farmers' readiness to adopt the introduced cultivation innovations. According to Rogers (2003), readiness to accept and implement an innovation is a crucial stage in the innovation diffusion process because it reflects changes in community attitudes before the technology is actually applied in practice. Thus, the high percentage of farmers who stated they were ready to implement the jajar legowo planting system can serve as an early indicator of the success of technology transfer in this community

service activity. These findings indicate that extension services not only function as a medium for conveying information but are also capable of building farmers' trust in the benefits of the introduced technology.

The results of this activity are consistent with various studies and community service initiatives that emphasize the importance of a participatory approach in the community learning process. Knowles et al. (2015) explain that the learning process for adults is more effective when the material presented is directly related to the participants' needs, experiences, and work. This view is reinforced by Kolb (2015), who states that real-world experiences are a crucial component of experiential learning, enabling participants to more easily understand and retain the information they learn. Consistent with this, Matonda et al. (2026) report that implementing participatory community engagement programs can increase community acceptance of appropriate technology because participants are actively involved in the learning process. Similar results were also reported by Kadju and Timang (2026), who demonstrated that a combination of extension activities, discussions, and direct interaction with participants effectively improves community understanding while fostering their readiness to adopt new technologies. Therefore, the approach applied in this activity has the potential to serve as an effective extension model for accelerating the adoption of rice cultivation innovations at the farmer level.

Benefits of the Jajar Legowo Planting System for Rainfed Paddy Rice Cultivation

The jajar legowo planting system is an innovation in rice cultivation that has been widely recommended because it improves the efficiency of plant growing space utilization while enhancing the microenvironment around the crops. Through a more regular planting spacing arrangement, each rice clump gains a larger growing space, allowing sunlight to be distributed more evenly. These conditions enhance photosynthetic activity, which influences vegetative growth, the formation of productive tillers, and the grain-filling process. In addition, the empty spaces formed in the jajar legowo system create a "border effect"—a condition in which all rice clumps benefit as if they were located at the edge of the rice field. This phenomenon has been reported to increase crop productivity compared to conventional planting systems with denser plant populations (Donggulo et al., 2017; IRRI, 2013).

In addition to promoting plant growth, the legowo planting system also improves the efficiency of rice cultivation management. Wider row spacing makes it easier for farmers to weed, apply fertilizer, spray pesticides, and monitor crop development as well as pest and disease infestations. These conditions are particularly important in rain-fed rice fields, which have a relatively short growing season, meaning that every stage of crop maintenance must be carried out in a timely manner. More efficient crop management not only has the potential to increase crop yields but also reduces labor requirements and production costs in the long term. According to Wibowo (2025), the adoption of the jajar legowo planting system simplifies the implementation of various cultivation activities, thereby enhancing the overall effectiveness of farm management.

During the extension session, these various benefits were the most frequently discussed topics among participants. Most farmers reported that they had been struggling with weeding because the plants grew too densely, allowing weeds to spread rapidly and become difficult to control. Another common problem was the high humidity around the crops, which encouraged the spread of pests and diseases. Through an explanation of the basic principles of the jajar legowo planting system, participants began to understand that adjusting planting distances is not only intended to increase crop density but also to improve growing conditions so that plants can access light, water, and nutrients more effectively. This understanding demonstrates that

the extension activity successfully linked scientific concepts to the real-life experiences farmers face daily, making the introduced technology easier to accept.

The findings of this study are consistent with various research results indicating that the application of the *jajar legowo* planting system can improve cultivation efficiency while supporting increased rice productivity when implemented in accordance with local agroecosystem conditions. Donggulo et al. (2017) reported that adjusting planting distances through the *jajar legowo* system increased the number of productive tillers and grain yield compared to conventional planting systems. Meanwhile, IRRI (2013) explains that proper plant population management is a key component of best management practices for sustainably improving rice production efficiency. Therefore, the adoption of the *jajar legowo* planting system on rain-fed paddy fields in Wangka Village shows great promise as a strategy to enhance farmers' capacity to manage their farming operations more efficiently, adaptively, and sustainably.

Implications of the Program for Farmer Empowerment and the Sustainability of Rice Cultivation

Extension activities on the *jajar legowo* planting system not only provided farmers with additional knowledge about rice cultivation techniques but also contributed to enhancing the community's capacity to adopt more effective agricultural innovations. The increase in knowledge, coupled with farmers' high readiness to implement the *jajar legowo* planting system, indicates that the learning process carried out was able to build participants' confidence in the benefits of the introduced technology. In the context of community empowerment, changes in knowledge and attitudes are crucial initial steps before behavioral changes occur in actual farming practices in the field. Therefore, the success of this initiative is measured not only by the conduct of the extension sessions but also by the emergence of farmers' motivation to independently apply the technology during the next planting season.

This success was largely due to the participatory approach implemented throughout the program (Pretty, 1995; Van den Ban & Hawkins, 1999; Leeuwis (2004). Through discussions, question-and-answer sessions, and the sharing of experiences, farmers not only received information from the presenters but also played an active role in identifying cultivation issues and evaluating the suitability of the *jajar legowo* planting system for their land conditions. This approach allows the learning process to take place in a more contextual manner because the material presented is tailored to the community's real needs. According to Knowles et al. (2015), adult learning is more effective when participants have the opportunity to relate the material they are studying to their own work experiences. This view is reinforced by Kolb (2015), who states that direct experience is a key component of experiential learning, thereby enhancing participants' understanding while also encouraging behavioral change.

From an agricultural development perspective, the adoption of the *jajar legowo* planting system holds broader potential than simply improving cultivation techniques. Better spacing allows for more efficient use of resources such as light, water, and nutrients, thereby supporting sustainable crop productivity. In addition, a more organized planting system makes it easier for farmers to monitor crop growth, control weeds, and manage plant pests more effectively. Efforts to build farmers' capacity through extension activities like this align with the goals of sustainable agricultural development, which emphasize the importance of enhancing human resource competencies as the foundation for improving food security and the well-being of rural communities (FAO, 2024).

The sustainability of community service programs requires synergy among universities, local governments, agricultural extension workers, and farmer groups so that the technologies introduced can be consistently applied at the field level. Follow-up activities may include

establishing demonstration plots for the legowo row-planting system, providing guidance during the next planting season, conducting field schools for farmers, and monitoring technology adoption rates after extension activities are completed. Ongoing guidance will provide farmers with the opportunity to find solutions to various challenges that may arise during technology implementation. Thus, this community service initiative not only leads to short-term knowledge gains but also lays the foundation for a more productive, efficient, adaptive, and sustainable rice cultivation system in Wangka Village.

CONCLUSION

Community service activities through outreach on the “jajar legowo” planting system in Wangka Village, Ngada Regency, successfully increased farmers’ knowledge and readiness to understand and adopt more effective rice cultivation technologies on rain-fed paddy fields. The Participatory Action Research (PAR) approach, which integrates extension, participatory discussions, and mentoring, created an interactive learning process that enabled farmers not only to gain new knowledge but also to connect the material presented to the real-world challenges they face in their farming activities. Evaluation results show that all participants actively engaged in the activities, while more than 85% of farmers stated they were ready to implement the jajar legowo planting system in the next planting season, indicating a high level of acceptance of the introduced technology.

In addition to enhancing technical knowledge, this initiative also strengthens farmers’ capacity to understand the importance of proper planting spacing as a key strategy for improving the efficiency of rice cultivation, weed control, and the management of plant pests and diseases. This capacity-building serves as a foundation for encouraging behavioral changes among farmers toward the adoption of more productive, efficient, and sustainable farming systems. Therefore, the program’s sustainability must be supported through ongoing guidance, the development of demonstration plots for the jajar legowo planting system, the strengthening of farmer groups’ roles, and collaboration among universities, local governments, and agricultural extension workers so that technology adoption can occur on a broader scale and have a tangible impact on improving farm productivity and farmers’ well-being.

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