



AGROMIX

pISSN (Print): 2085-241X; eISSN (Online): 2599-3003
 Website: <https://jurnal.yudharta.ac.id/v2/index.php/agromix>

Farmers interest in the use of agricultural machinery services at UPJA Ngupoyo Boga, Mulur Village, Bendosari District, Sukoharjo Regency

Ellyana Rovita Sum¹, Kadhung Prayoga^{1*}, and Joko Mariyono¹

¹ Agribusiness, Faculty of Animal and Agricultural Sciences, Universitas Diponegoro, Jl. Prof. Soedarto SH, Semarang, Indonesia

*Correspondence email: kadhungprayoga@gmail.com

Original article

ABSTRACT

Article history

Received : March 7, 2025

Accepted : September 17, 2025

Published : September 30, 2025

Keyword

Farmers' interest;

Agricultural mechanization;

Machinery service utilization;

Technology adoption;

Introduction: The Agricultural Machinery Service Business (UPJA) Ngupoyo Boga was the only UPJA in Bendosari District; however, it became inactive between 2020 and 2024 due to incompetent management. This study aimed to identify the factors that shaped farmers' interest and analyze their influence on the use of agricultural machinery services at UPJA Ngupoyo Boga. **Methods:** The research was conducted from December 2024 to January 2025 in Mulur Village. The method used was a survey with disproportionate stratified random sampling, involving 185 rice farmers. Primary data was obtained through interviews using open and closed questionnaires, while secondary data was taken from previous studies, including books, journals, and official data from relevant institutions. Data analysis was performed descriptively and using multiple linear regression analysis with SPSS 26. **Results:** The results showed that the factors influencing farmers' interest in Mulur Village regarding the use of agricultural machinery services included gender, age, education level, years of farming, and the size of land owned. The interest variable scored in the moderate category (77.60%), enjoyment in the high category (80.50%), and willingness in the high category (84.07%). The interest, enjoyment, and willingness variables had a significant effect on the use of agricultural machinery services, both simultaneously and partially. **Conclusion:** Recommendations for UPJA management included developing a routine maintenance schedule, encouraging cooperation among farmers, and suggesting that the government conduct surveys to understand farmers' agricultural machinery needs.

Cite this article:

Sum, E. R., Prayoga, K., & Mariyono, J. (2025). Farmers' interest in the use of agricultural machinery services at UPJA Ngupoyo Boga, Mulur Village, Bendosari District, Sukoharjo Regency. *Agromix*, 16(2), 226–241. <https://doi.org/10.35891/agx.v16i2.6101>

INTRODUCTION

The development of the times brought changes to the agricultural cultivation system. Farmers switched from traditional tools to modern machines to increase productivity and efficiency. The use of agricultural technology aimed to optimize resources, reduce manual labor, and improve yields. Modernization through agricultural tools and machinery (alsintan) helped farmers cultivate land more quickly. According to data from the Direktorat Jendral Prasarana dan Sarana Pertanian (2022), from 2017 to 2021, the government distributed 9,370 units of alsintan to support sustainable food self-sufficiency programs for rice, corn, and soybean commodities.

Modern agricultural system produced higher productivity compared to conventional systems. The production from the modern agricultural system was higher than that of the conventional agricultural system (Indrayanti, 2024). This allowed farmers to cultivate larger areas and increase planting intensity. Based on data from the Sensus Pertanian (2023), rice became the main commodity in Indonesia, with 9.41 million units of hybrid rice farming enterprises. The modern agricultural program was an initiative from the Kementerian Pertanian Republik Indonesia aimed at developing technology in rice farming.

Modern agricultural program was implemented in several provinces, namely South Sumatra, Lampung, Banten, West Java, Central Java, East Java, South Kalimantan, Central Kalimantan, South Papua, and South Sulawesi. The implementation of this program in Central Java was located in Sukoharjo Regency. Sukoharjo Regency in Central Java had the highest rice productivity in the province, reaching 70.27 quintals/ha in 2023 (BPS, 2024). This area played a strategic role in the development of modern agriculture and was expected to serve as an example for other regions in increasing productivity and supporting food self-sufficiency.

Based on data from BPS Sukoharjo (2024) about the development of rice productivity in Sukoharjo Regency over the last five years, it fluctuated, but in 2023 there was a significant increase reaching 5.86 quintals/ha from 64.41 quintals/ha

to 70.27 quintals/ha. The high productivity with a land area of only 47,901.05 ha was part of the result of the use of agricultural machinery in rice farming activities in Sukoharjo Regency. Before the use of agricultural machinery, rice cultivation by farmers in the area was still conventional, so it took a long time and cost more to pay for labor. Over time, the government's agricultural machinery assistance program was optimized and managed through farmer groups/cooperatives/agricultural machinery units/agricultural machinery brigades. The ease for farmers in cultivating rice was influenced by agricultural modernization.

The rice field area in Bendosari District was 2,528 ha out of a total of 20,460 ha as the largest rice field area in Sukoharjo Regency (BPS, 2019). Along with the large rice field area, the majority of rice farmers in Bendosari District had utilized agricultural machinery in managing their land. This was proven by the existence of UPJA in the area, namely UPJA Ngupoyo Boga. Based on the Minister of Agriculture Regulation (2008) regarding guidelines for the establishment and development of UPJA, it explained that UPJA, as an institution that developed agricultural machinery, was formed considering that farmers had limitations in managing land, and individual management of agricultural machinery was less efficient.

The existence of UPJA became an economic institution for a village to support the development of farming. The presence of UPJA in Bendosari District not only helped farmers in rice cultivation activities but also supported food security in the area. The need for agricultural machinery was not matched by the existence of management units; in Bendosari District, there was only one UPJA, which was managed by the Mulur Village Farmer Group (Gapoktan). This imbalance caused other villages in the area, although they already had farmer institutions, to not focus on the management of agricultural machinery.

The management of agricultural machinery at UPJA Ngupoyo Boga faced issues in its organizational management. Political problems became a source of its decline. It was established in 2012, originating from the award of agricultural machinery received by the Mulur Village Farmer Group. Over time, the assistance of agricultural machinery increased, leading to the formation of UPJA as a management platform for farmers' agricultural machinery in Mulur Village. The benefits of UPJA extended not only to the farmers of Mulur Village but also to farmers from surrounding villages who used the rental services of agricultural machinery. From 2012 to 2020, it was a period of active service for UPJA Ngupoyo Boga in providing rental services for agricultural machinery, including 2-wheel tractors, 4-wheel tractors, threshers, transplanters, and others. However, in 2020, coinciding with village politics, namely the village head election, changes in regulations occurred. This led to a change in the management of the UPJA, which was replaced by less competent managers, resulting in UPJA Ngupoyo Boga becoming inactive from 2020 to 2024. Through the modern agricultural program that had been implemented, efforts were made little by little to reactivate UPJA.

Research on farmers' perceptions of UPJA had been conducted by several researchers, but there were still few studies focusing on farmers' interest in using UPJA agricultural machinery services. Some previous studies had explored farmers' participation in modern agricultural programs and their perceptions of certain agricultural tools. For Instance, Adiarsi *et al.* (2020) found that farmers' participation in modern agricultural programs was quite high at the planning and monitoring stages, but the implementation was still low. Meanwhile, Hertanto *et al.* (2019) showed that farmers' perceptions of the jarwo transplanter tool were at a moderate level, indicating the need for strategies to improve their understanding. The research by Tarigan (2018) showed that basically, the development of UPJA had to have guidelines so that synergy within it could form a large corporation. In line with Irwanto *et al.* (2023), farmers' perceptions of UPJA usage were shaped by several factors such as length of formal education, age, farming experience, land area, access to information, the role of extension workers, and the role of farmer groups. This study aimed to fill that gap by exploring farmers' interest in using UPJA agricultural machinery services and the factors influencing it.

Based on these issues, the researchers were interested in analyzing farmers' interest in using the agricultural machinery services of UPJA Ngupoyo Boga to understand its impacts and benefits for farmers as well as to evaluate the UPJA development program. This study was expected to help provide recommendations for the development of UPJA Ngupoyo Boga in Mulur Village and the establishment of UPJA in other villages within the Bendosari District. This study aimed to identify the characteristics of farmers in Mulur Village regarding the use of agricultural machinery services from UPJA Ngupoyo Boga and to analyze the influence of farmers' interest in using these services in Mulur Village. It was hoped that this research could help provide recommendations for the development of UPJA Ngupoyo Boga in Mulur Village and was expected to initiate the establishment of UPJA in other villages within the Bendosari District.

METHODS

Research location

The research was conducted over 2 months, from December 2024 to January 2025, in Mulur Village. The research location was chosen purposively based on the consideration that Mulur Village was the only village with UPJA in Bendosari District, which had the largest rice paddy area. Bendosari District was the area with the largest rice paddy area in Sukoharjo Regency, covering 2,528 ha (BPS Sukoharjo, 2023).

Method used

The research method used in this study was a survey method that involved taking a number of samples from the rice farmer population in Mulur Village. The survey method was a method for obtaining data that occurred in the past or at present regarding beliefs, opinions, characteristics, behaviors, and relationships (Sugiyono, 2023).

Sampling method

The sampling in this research was conducted on rice farmer respondents in Bendosari District from Mulur Village. The population in this study consisted of 356 rice farmers from Mulur Village in Bendosari District. The sample size was determined using the Isaac and Michael formula with a sampling error rate and confidence level of 5%. The sampling in this study used disproportionate stratified random sampling, which was a method of randomly selecting sample members while considering the existing strata in the population based on level of education, but the number and proportion were not proportional (Sugiyono, 2023). The Isaac and Michael formula used (Sugiyono, 2023) was as follows:

$$S = \frac{\lambda^2 \cdot N \cdot P \cdot Q}{d^2(N-1) + \lambda^2 \cdot P \cdot Q}$$

$$S = \frac{3.841 \times 356 \times 0.5 \times 0.5}{0.05^2 \times (356-1) + 3.841 \times 0.5 \times 0.5} = \frac{341.8}{1.847} = 185$$

Description:

S : Sample Size

λ^2 : Chi-Square with a confidence level of 5%

d : The difference between the population mean and the sample mean with a sampling error of 5%

N : Population Size

P : Probability of Success (0.5)

Q : Probability of Failure (0.5)

Based on the sample determination above, it was found that the number of respondents in this study was 185 farmers.

Data collection

The data used in this study consisted of primary and secondary data. Primary data was obtained from respondents through interviews, questionnaires, focus groups, and panels, while secondary data came from records, books, published articles, and government reports (Sujarweni, 2023). The primary data in this study was obtained through the following processes:

1. Observation involved directly observing the agricultural conditions in Mulur Village by visiting the rice fields in Mulur Village and the UPJA Ngupoyo Boga office/warehouse, interacting with rice farmers and UPJA managers, observing the rice cultivation process, and attending farmer group meetings. The observations were recorded and documented through photos, videos, and audio recordings.
2. Interviews in this study aimed to collect data consisting of the farmers' names, gender, age, education level, years of farming, land area, and statements regarding their interest, enjoyment, willingness, and use of agricultural machinery services. The interviews were conducted during December 2024 to January 2025.

The secondary data used in this study was obtained through the following processes:

1. Literature review included books, journals, and official data from related institutions, such as Badan Pusat Statistik (BPS), the Mulur Village Government, and the Agriculture and Fisheries Office of Sukoharjo Regency. The literature collection was conducted by searching in libraries and online databases, as well as contacting related institutions to obtain the necessary official data. The criteria for selecting sources included relevance to the research topic, reliability of information, and the most recent publication year. The process of collecting literature data was carried out during the preparation of the research proposal, the implementation of the research, and the preparation of the research report.
2. Documentation in this study was carried out by taking photos, recording videos, and audio. The documentation of images in this study consisted of activities such as interviews with farmers, the condition of the land in Mulur Village, and meetings with farmers, which were taken using a mobile phone camera. This was carried out over the period from October 2024 to January 2025 at various locations.

Data analysis

The data analysis methods used in this study were descriptive analysis and statistics. Statistical data analysis was a method that described or illustrated the data that had previously been collected without the intention of making general conclusions or generalizations (Sugiyono, 2023). The descriptive statistical analysis in this study used calculations based on the percentage of farmers' response scores, which were described using an interval scale. The instrument tests

included validity and reliability tests, as well as classical assumption tests, which comprised normality, heteroscedasticity, and multicollinearity tests. The multiple regression test in this study was used to determine the influence of the independent variables interest (X_1), enjoyment (X_2), and willingness (X_3) on the dependent variable which was the use of agricultural machinery services (Y). The formula for multiple linear regression (Sugiyono, 2023) was described as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

Description:

- Y : Use of Agricultural Machinery Services
 a : Constant value
 $b_1 - b_7$: Regression coefficients for each variable
 X_1 : Interest
 X_2 : Enjoyment
 X_3 : Willingness
 e : Error term (level of error)

RESULTS AND DISCUSSION

General description of the UPJA Ngupoyo Boga

The Agricultural Machinery Services Unit (UPJA) Ngupoyo Boga was a business unit under the auspices of the Hesti Tomo farmer group association (Gapoktan) from Mulur Village, Bendosari District, Sukoharjo Regency. It was established in 2012, originating from the provision of agricultural machinery assistance by the central government because Gapoktan Hesti Tomo won the national Water User Farmers Association (P3A) competition in 2011. As it progressed, the assistance of agricultural machinery from the Sukoharjo local government increased, leading to the formation of UPJA Ngupoyo Boga. The establishment of this UPJA was under the supervision of the Balai Penyuluhan Pertanian (BPP) of Bendosari District and the Agriculture and Fisheries Office of Sukoharjo Regency.

The name “Ngupoyo Boga” was chosen because it means striving for food. The hope was that the existence of this UPJA could assist farmers, especially in Mulur Village, in cultivating or managing food crops, particularly rice. The purpose of establishing UPJA was to help improve the welfare of farmers and serve as a means for the government to provide assistance in the form of agricultural machinery. This was based on Permentan No. 25 of 2008, which stated that the establishment of UPJA aimed to optimize the use of agricultural machinery in rural communities, increase planting indices, accelerate and improve harvest quality and processing, address labor shortages, and create job opportunities in rural areas.

Table 1. Data and condition of agricultural machinery at UPJA Ngupoyo Boga

Types of agricultural machinery	Total	Condition	
		Normal	Damaged
	--- units---	---units---	---units---
Hand Tractor (TR2)	6	5	1
Quick Tractor (TR4)	1	-	1
Power Thresher	4	2	2
Water Pump	3	3	-
Transplanter	1	-	1
Total	15	10	5

Source: Primary data processing result, 2025

Based on Table 1, the data and condition of agricultural machinery at UPJA Ngupoyo Boga showed that there were 15 types of agricultural machinery, consisting of 6 units of 2-wheel tractors (TR2), 1 unit of 4-wheel tractor (TR4), 4 units of power threshers, 3 units of water pumps, and 1 unit of transplanter. The first agricultural machinery at UPJA Ngupoyo Boga came from a P3A competition prize, which included 3 units of TR2, 1 unit of TR4, and 1 unit of water pump, while the others were provided as assistance for farmer groups. At that time, the condition of the agricultural machinery at UPJA included 5 units of TR2 in normal condition and 1 unit damaged, 1 unit of TR4 in damaged condition, 2 units of power threshers in normal condition and 2 units damaged, 3 water pumps in normal condition and 3 units damaged, and 1 unit of transplanter in damaged condition. When UPJA became inactive, the abandoned agricultural machinery deteriorated because it was not operated.

The rice commodity farming in Mulur Village had 3 planting seasons (MT), with the first planting season usually taking place between November and February, the second planting season occurring between March and June, and the

third planting season occurring between July and October. The timing of these planting seasons could advance or delay depending on water availability and other unforeseen conditions. Typically, the agricultural machinery from UPJA was rented during the pre-planting period, planting season, and harvest. Tractors were the agricultural machinery rented by farmers during the pre-planting period. Based on field observations, most farmers in Mulur Village preferred to use TR2 for land preparation rather than TR4 (Figure 2).

Most of the land in Mulur Village $\pm 2,000 \text{ m}^2$ so farmers preferred TR2 because of ease of maneuvering on small plots and there were more units available, which meant they didn't have to wait too long for their turn to use it compared to other farmers. Additionally, TR2 was not only used for turning over the soil but also for leveling the land for rice seedbeds, so farmers didn't need to pay double rental costs. TR2 was one of the types of agricultural machinery with the most units at UPJA Ngupoyo Boga, totaling 5 units, whereas other agricultural machinery had less than that.



Figure 2. *Farmers' land preparation using TR2 in Mulur Village*
Source: Research documentation, 2025

At the beginning of its establishment, UPJA Ngupoyo Boga was led by Mr. Sahono as the manager, with Mr. Suwanto as the chairman of Gapoktan. From 2012 to 2020, the rental services for agricultural machinery were still managed independently by UPJA under the supervision of Gapoktan until the village head election in 2020. Based on the new village leadership, there was a proposal for a change in UPJA management, which was agreed upon. After the management change, the operations of UPJA became increasingly directionless and ended up in a vacuum. As a result, some agricultural machinery was neglected and poorly maintained, and a two-wheeled tractor was taken over by each farmer group. Although UPJA was inactive, farmers continued to use the rental services for agricultural machinery sourced from government assistance through the farmer groups.



Figure 3. *Regular meetings of UPJA Ngupoyo Boga*
Source: Research documentation, 2025

The activities of UPJA Ngupoyo Boga encompassed various activities designed to support farmers in increasing productivity, which included the rental of agricultural machinery, regular meetings, and operator training. First, the rental of agricultural machinery became one of the main focuses, allowing farmers to rent various modern agricultural tools and machines, such as hand tractor, quick tractor, rice transplanters, and power threshers. The regular meetings of UPJA Ngupoyo Boga were held once a month aimed to strengthen the relationships among farmers, discuss the issues faced by farmers when renting agricultural machinery, and provide guidance from the agricultural extension workers (PPL) or the village government (Figure 3).

These meetings played a crucial role in fostering farmer participation and engagement in UPJA activities, enabling the UPJA management to better understand and address the needs and concerns of farmers, ultimately contributing to more effective management and service delivery. The training for operators aimed to ensure that the rented equipment could be used optimally and safely, as well as to improve the technical skills of the operators in supporting agricultural activities in the area. This was in accordance with the opinion of Faradisi *et al.* (2023), that the formation of farmer groups (gapoktan and poktan) was expected to serve as a platform for its members to interact and discuss.

Characteristics of farmers

The characteristics of the respondents represented a general description that encompassed several aspects related to the respondents in this research. The respondents in this study were farmers who lived in and owned rice fields in Mulur Village, totaling 185 individuals. The aspects of the respondents' characteristics in this research included gender, age, education level, farming experience, and land size. The farmers in this study were cultivators who owned rice fields in Mulur Village, either through rental or ownership. The following was the result of the research by gender characteristic.

Table 2. Gender of farmers in Mulur Village

No.	Gender	Total	Percentage
1.	Male	173	93
2.	Female	13	7
	Total	185	100

Source: Primary data processing result, 2025

Based on Table 2, it was found that the respondents in this study were predominantly male farmers, totaling 173 individuals with a percentage of 93%, while female farmers numbered 13 individuals with a percentage of 7%. The presence of male farmers was greater than that of female farmers. According to the conditions at the research location, the majority of farmers in Mulur Village who understood the use, operation, and maintenance of agricultural machinery such as TR2, TR4, and others in rice cultivation were male farmers, while most female farmers did not have this understanding. This created a disparity in the use of agricultural machinery for rice cultivation based on gender, as it was predominantly controlled by male farmers. In line with the views of Kadir & Prasetyo (2023), generally, the productivity of female farmers in rice farming in Indonesia was lower than that of male farmers.

According to the field conditions, female farmers' involvement in rice farming in Mulur Village was limited, with only manual tasks like planting and weeding being done, and even fewer were involved in harvesting. This was because most land management tasks, such as land processing and harvesting, were already done using heavy machinery. However, female farmers did participate in financial management and collaborated with male farmers on operational activities. As noted in the study by Sraboni *et al.* (2014), similar issues were discussed regarding female farmers' participation in agricultural activities, and it was emphasized that policies supporting the enhancement of women's roles in resource management, access to finance, and education in the agricultural sector were crucial for strengthening food security and reducing gender disparities in Bangladesh.



Figure 4. Farmer group meeting held in a makeshift shelter

Source: Research documentation, 2025

The average farmer in Mulur Village who actively participated in agricultural institutions was a male farmer. This was observed during the farmer group meeting held in a makeshift shelter to discuss the planting season, which was mostly attended by male farmers (Figure 4). Female farmers typically only engaged in a few cultivation activities, resulting in limited access to important resources such as capital, information, and training. This limitation hindered the active participation of women in the development activities of UPJA. According to Alawiyah *et al.* (2018), access to financial resources and training was crucial for increasing women's participation in agriculture. There was a women's farmer

group in Mulur Village, but it only focused on home gardening, which did not heavily rely on heavy agricultural machinery.

The involvement of female farmers in rice commodity farming in the village tended to be minimal, with only manual tasks such as planting and weeding being performed, and very few participated in harvesting. According to Prayoga & Yuliati (2015) that to improve the skills of women farmers, the head of the farmer group association involved them in all agricultural activities. This was due to the fact that the management of rice fields, such as land preparation and harvesting, mostly utilized heavy machinery. In line with Sungkawa (2014) opinion, the role of female labor in land preparation was relatively minimal, as this work was quite heavy and generally performed by men who could operate the machinery. These reasons contributed to the limited role and involvement of female farmers in UPJA Ngupoyo Boga in Mulur Village.

Farmers, as actors in rice farming, played an important role in decision-making for every cultivation activity that was carried out. According to Soekartawi (1998), as cited by Fitriana *et al.* (2022), farmers' decision-making was influenced by age, the size of agricultural land, income, education, economic environment, and social environment. The following was the result of the research by age characteristic.

Table 3. Age of farmers in Mulur Village

No.	Age	Total	Percentage
1.	20 – 30	1	0.5
2.	21 – 40	5	2.7
3.	41 – 50	40	21.6
4.	51 – 60	72	39
5.	61 – 70	53	28.6
6.	71 – 80	14	7.6
	Total	185	100

Source: Primary data processing result, 2025

Based on the data in Table 3, it was found that the respondents in this study were predominantly farmers aged 51 to 60 years, totaling 72 individuals with a percentage of 39%. The research results indicated that the average farmer in Mulur Village was mostly categorized as elderly. The age of farmers was related to the level of adoption in rice cultivation that was to be carried out. This was in accordance with the opinion of Puspita *et al.* (2023), which stated that the older the farmers were, the higher the level of adoption of agricultural innovations.

The farmers of Mulur Village who became respondents in this study considered rice farming as their occupation in old age. This was found among farmers over 40 years old who previously had jobs outside the agricultural sector. One example was Mr. Juandi, aged 51, who started rice farming at the age of 44. Mr. Juandi made this decision at that age because while he was still capable and productive, farming was also a promising occupation. Each age group of farmers influenced their ability and skills in using agricultural machinery. According to Bachri *et al.* (2019), farmers' age had a significant effect on the level of technology adoption in rice cultivation, where older farmers were more open to adopting innovations that had proven effective.

Conversely, younger farmers, although in their productive years, were often less experienced in using agricultural machinery and thus more hesitant to adopt new technology without adequate training. Field realities showed the same pattern: farmers aged 20–30 participated much less in using agricultural machinery for rice cultivation compared to those aged 41 and above. Similarly, Fitriyana *et al.* (2023) indicated that young farmers tended to be more open to technology, but lack of experience could hinder them from optimally utilizing agricultural machinery. Therefore, a program design related to training was needed to improve the skills of farmers in using agricultural machinery across various age groups.

The farmers of Mulur Village who became respondents in this study considered rice farming as their occupation in old age. This was found among farmers over 40 years old who previously had jobs outside the agricultural sector. One of them was Mr. Juandi, who was 51 years old and began farming rice at the age of 44. He made this decision at that age because, while he was still capable and productive, farming was also a promising occupation. Each age group of farmers influenced their ability and skills in using agricultural machinery. According to Bachri *et al.* (2019), the age of farmers had a significant impact on the level of technology adoption in rice cultivation, where older farmers were more open to adopting innovations that had proven effective.

Conversely, younger farmers, despite being in their productive years, often lacked experience in using agricultural machinery, making them hesitant to adopt new technologies without adequate training. The reality in the field showed the same trend, as farmers aged 20 to 30 had very little participation in using agricultural machinery for rice cultivation compared to those aged 41 and above. According to Fitriyana *et al.* (2023), young farmers also tended to be more open to technology, but their lack of experience could hinder them from utilizing agricultural machinery optimally. Therefore,

there was a need for a program design related to training that was suitable for improving the skills of farmers of various age groups in using agricultural machinery.

According to UU No. 20 of 2003, formal education was a type of education that had levels consisting of elementary education (SD), secondary education (SMP/SMA), and higher education (universities). The following was the result of the research by level of education of farmers.

Table 4. Level of education of farmers in Mulur Village

No.	Level of Education	Total	Percentage
1.	No schooling	11	6
2.	Elementary school or equivalent	57	31
3.	Junior high school or equivalent	44	24
4.	Senior school or equivalent	59	32
5.	College/University	14	7
Total		185	100

Source: Primary data processing result, 2025

Based on Table 4, it was found that the education level of the respondents in this study was predominantly at the senior high school (SMA) level, with 59 individuals, while on the other hand, there were 57 farmers with an elementary school (SD) education level. The education of farmers was related to their individual ability to understand information. This was consistent with what was found at the research location, where farmers with a senior high school education were more skilled in operating and maintaining agricultural machinery for rice cultivation than farmers with an elementary school education. The reason was that farmers who graduated from senior high school had been equipped with knowledge about machine maintenance, allowing them not only to use the machinery but also to repair it when it broke down. According to Wirayuda & Arka (2024), the educational background of farmers positively influenced their knowledge, skills, and insights for adopting new methods in agricultural activities.

Based on the observations that had been conducted, the farmers in Mulur Village who actively participated in the management of UPJA Ngupoyo Boga were farmers with junior high school, senior high school, and higher education backgrounds. These farmers participated as administrators of UPJA out of their own desire to help advance agriculture in Mulur Village. One of the farmers, Mr. Parto, was skilled and knowledgeable in using TR2-type agricultural machinery due to his educational background, which was in Vocational High School (STM) with a major in automotive. The head of UPJA Ngupoyo Boga, Mr. Sahono, had a bachelor's degree, and the reason he was chosen to be the chairman again was due to his abilities and insights. Rice farmers with higher education levels typically had broader knowledge, skills, and perspectives (Bachri *et al.*, 2019).

The length of time spent farming referred to the duration that farmers dedicated to engaging in or carrying out agricultural activities over the years. The details of the farming experience of the respondents in this study were as follows.

Table 5. Farming experience

No.	Farming experience	Total	Percentage
1.	1 – 10	58	31
2.	11 – 20	58	31
3.	21 – 30	39	21
4.	31 – 40	5	3
5.	41 – 50	24	13
6.	51 – 60	1	1
Total		185	100

Source: Primary data processing result, 2025

Based on Table 5, it was found that the farming experience of the respondents in this study was predominantly in the range of 1 to 10 years, with 58 farmers and a percentage of 31%. The same was observed in the range of 11 to 20 years, also with 58 farmers and a percentage of 31%. The farmers in Mulur Village who served as respondents in this study, with farming experience of 1 to 10 years, included new farmers who mostly were not very familiar with UPJA Ngupoyo Boga. Rice cultivation using agricultural machinery was carried out following the guidance from the farmer group. In contrast, farmers with 11 to 20 years of experience or more were mostly familiar with UPJA Ngupoyo Boga because they had utilized its services. The length of time spent farming was related to the farmers' experience in agricultural practices. This was in accordance with the opinion of Gusti *et al.* (2021), that farmers who had been involved in agricultural activities for a long time generally had a high level of skills and experience in managing their farming enterprises.

Farmers in Mulur Village, as respondents in this study with 11 to 20 years of farming experience had a better mastery than those with 1 to 10 years of experience; however, both groups were open to the adoption of new agricultural machinery or innovations. Furthermore, farmers with 21 to 30 years of experience usually found it was slightly challenging for them to accept the adoption of new agricultural innovations, such as the use of agricultural machinery, unless they had seen tangible evidence or results that had been practiced by other farmers. The same applied to those with 31 to 40 years of experience and beyond; the reason was that these farmers felt accustomed to rice cultivation for many years, making them more conservative and inclined to reject innovations. In accordance with the opinion of Made *et al.* (2016), it was explained that an increase in farmers' experience could decrease their motivation to adopt agricultural innovations.

Land was an important aspect in rice farming, especially regarding the use of agricultural machinery for cultivation. The size of the land was related to the amount of production from the farmers' agricultural activities. The production of agricultural activities was significantly influenced by the size of the land (Simatupang *et al.*, 2021). The characteristics of the respondents based on land size were as follows.

Table 6. Land size of farmers in Mulur Village

No.	Land Size	Category	Total	Percentage
1.	< 0,5	Small	56	30
2.	0,5 – 1	Medium	96	52
3.	> 1	Large	33	18
	Total		185	100

Source: Primary data processing result, 2025

Based on Table 6, it was found that the land size owned by the respondents in this study included 56 individuals with land size of less than 0.5 hectares, accounting for 30%. There were 96 individuals with land size between 0.5 and 1 hectare, representing 52%, and 33 individuals with land size greater than 1 hectare, making up 18%. This indicated that the majority of farmers in Mulur Village had land categorized as medium. According to field findings, farmers with land size of less than 0.5 hectares usually cultivated rice for household food needs, so the use of agricultural machinery was only on a small scale and required several considerations for its use. Typically, farmers with limited land used agricultural machinery when access was easy; however, if there was no access, they chose not to use it. Farmers with land size between 0.5 and 1 hectare cultivated rice on a medium scale and were usually profit-oriented, leading many of them to use agricultural machinery more frequently. Meanwhile, farmers with land size greater than 1 hectare viewed rice farming as a long-term investment and many of them heavily relied on the use of agricultural machinery to assist with their work. According to Nurmala (2012), as cited by Kharismawati & Karjati (2021), larger land sizes often produced more output than smaller land sizes.

The size of the land owned by farmers was related to their considerations for using agricultural machinery. One of the farmer respondents, Mr. Purwadi, had a land area of 6,000 m² and used the services of UPJA for rice cultivation because, with that medium-sized rice field, the use of machinery could lighten the workload and save time. According to Hantoro *et al.* (2020), the benefits of using agricultural machinery could accelerate the farming process and reduce physical workload, allowing farmers to allocate time and energy to other more productive activities. Farmers with land areas of less than 0.5 hectares in this study mostly preferred to use agricultural machinery if access to their land was easy. In line with the explanation from Mr. Sugiyanto, who had a land area of 1,020 m², he preferred to use agricultural machinery because it was close to the road, which farmers commonly referred to as 'galengan.'

Validity and reliability test

The questionnaire employed in this study served as the primary tool for collecting data from respondents; therefore, it was essential to ensure that the instrument possessed adequate levels of accuracy, precision, and consistency. To fulfill these requirements, validity and reliability tests were conducted prior to the distribution of the final questionnaire. A total of 30 respondents were involved in the preliminary testing phase, which was intended to evaluate the ability of each item to measure the intended variables. The results of the validity test are presented in Table 7. Based on these results, it was found that from the 30 items examined, 25 items met the validity criteria, indicated by significance values below 0.05. Meanwhile, 5 items were identified as invalid because they displayed significance values greater than 0.05. Only the valid items were retained for further analysis, while the invalid items were excluded to prevent potential measurement errors. This procedure aligns with the view of Sugiyono (2023), who asserts that items failing validity requirements should be removed or revised to ensure that the overall instrument reflects accurate and meaningful measurements. The removal of invalid items is also intended to strengthen the operational definition of the variables and improve the questionnaire's overall construct validity.

Subsequent to the validity assessment, a reliability test was carried out to determine the level of internal consistency among the validated items. Reliability testing plays a crucial role in ensuring that the instrument yields stable and consistent results when administered under comparable circumstances. The results of the reliability test are presented

in Table 8. The table shows that all variables achieved Cronbach's alpha values greater than 0.6, which indicates that the instrument items possess a satisfactory degree of reliability. A Cronbach's alpha coefficient above 0.6 signals that the items measuring the same construct are interrelated and capable of producing dependable and replicable data. This finding is in line with the statement of Saleleng and Soegoto (2015), who emphasize that a coefficient value exceeding 0.6 is indicative of acceptable reliability in social science research instruments. Based on these findings, it can be concluded that the questionnaire used in this study is both valid and reliable, and therefore appropriate to be used as a research instrument for collecting data related to the variables under investigation. The successful fulfillment of these psychometric criteria ensures that the data generated from the questionnaire can be trusted and meaningfully interpreted in subsequent analyses.

Table 7. Validity test result

Variable	Question Items	Alpha	Sig	Criteria
Interest (X1)	X1.1	0.05	0.075	Not Valid
	X1.2	0.05	0.000	Valid
	X1.3	0.05	0.000	Valid
	X1.4	0.05	0.039	Valid
	X1.5	0.05	0.088	Not Valid
	X1.6	0.05	0.377	Not Valid
	X1.7	0.05	0.024	Valid
Enjoyment (X2)	X2.1	0.05	0.000	Valid
	X2.2	0.05	0.000	Valid
	X2.3	0.05	0.000	Valid
	X2.4	0.05	0.048	Valid
	X2.5	0.05	0.673	Not Valid
	X2.6	0.05	0.000	Valid
Willingness (X3)	X3.1	0.05	0.010	Valid
	X3.2	0.05	0.189	Not Valid
	X3.3	0.05	0.002	Valid
	X3.4	0.05	0.000	Valid
	X3.5	0.05	0.000	Valid
	X3.6	0.05	0.000	Valid
The use of agricultural machinery services (Y)	Y1.1	0.05	0.001	Valid
	Y1.2	0.05	0.000	Valid
	Y1.3	0.05	0.000	Valid
	Y1.4	0.05	0.000	Valid
	Y1.5	0.05	0.000	Valid

Source: Primary data processing result, 2025

Table 8. Reliability test result

Variable	Cronbach's Alpha	N of Items	Criteria
Interest (X ₁)	0.751	8	Reliabel
Enjoyment (X ₂)	0.762	5	Reliabel
Willingness (X ₃)	0.695	5	Reliabel
The use of agricultural machinery services (Y)	0.768	7	Reliabel

Source: Primary data processing result, 2025

Farmers' interest in using agricultural machinery services from UPJA Ngupoyo Boga

The interest of farmers in Mulur Village in using the agricultural machinery services from UPJA Ngupoyo Boga could be determined from the scoring results. The following were the results of the calculation of the farmers' interest scores.

Based on Table 9, it was known that the interest of farmers in using the agricultural machinery services from UPJA Ngupoyo Boga was high, with an average score of 14.17 and a percentage of 80.73%. This indicated that the majority of farmers had a strong desire to utilize the agricultural machinery services provided by UPJA. This measured high interest strongly signals significant latent demand to reinstate UPJA services, especially following the down period. Aspects that played a role in the effectiveness of extension services included characteristics of farmers, extension worker capacity, institutional support, as well as access to resources and technology (Amghani *et al.* 2025). According to Mr. Bajuri's explanation, the existence of UPJA Ngupoyo Boga greatly helped farmers because before the UPJA was established, they had to wait a long time to use agricultural machinery due to not all farmers owning or renting it out.

Table 9. Farmers' interest indicator score

No	Indicator	Mean	Percentage	Criteria
----	-----------	------	------------	----------

	--person--	--%--	
1. Interest	17.85	77.60	Medium
2. Enjoyment	12.07	80.50	High
3. Willingness	12.61	84.07	High
Total	14.17	80.73	High

Source: Primary data processing result, 2025

Farmers in Mulur Village realized that the existence of UPJA was very important in supporting agricultural activities, especially in improving efficiency and productivity. Farmers hoped to continue gaining easy and quick access to agricultural machinery, so they would no longer have to wait long to rent farming equipment. The existence of UPJA as an intermediary for government assistance in agricultural machinery was intended to be utilized comprehensively by all farmers in the village so that they could experience its benefits. One farmer, Mr. Samsuri, explained that the presence of UPJA was expected not only to provide practical solutions in land processing but also to serve as a platform for farmers to share knowledge and experiences. According to Mayrowani (2012), it was stated that the professional utilization of UPJA could provide quality services to farmers, increase agricultural productivity, and generate sustainable profits.

Based on the reality in the field, it was shown that the majority of farmers in Mulur Village recognized the benefits and advantages that could be obtained from using agricultural machinery, such as increased efficiency in the farming process, time savings, and cost reductions. These farmers expressed disagreement with the notion that the use of agricultural machinery could directly increase crop yields; rather, it was determined by maintenance practices such as proper fertilization, pest control, and good irrigation management. In accordance with the opinion of Sudewi *et al.* (2020), it was stated that to increase rice production, farmers' income, and production competitiveness, appropriate pest control techniques were necessary. The same was explained by Idaryani *et al.* (2021), that the increase in rice production was influenced by the use of fertilizers and maintenance practices such as land preparation and weed control.

Multiple linear regression test

The multiple linear regression test was a regression equation test that used two or more independent variables. This was in accordance with the opinion of Sugiyono (2023), which explained that multiple linear regression was used when there were two or more independent variables. This test was used to determine the influence of the interest variable (X_1), enjoyment (X_2), and willingness (X_3) on the dependent variable which was the use of agricultural machinery services (Y). The results of the multiple linear regression test that had been conducted were as follows.

Table 10. Multiple linear regression test result

Variable	B
Constanta (a)	0.958
Interest (X_1)	0.251
Enjoyment (X_2)	0.233
Willingness (X_3)	0.479

Source: Primary data processing result, 2025

Based on Table 10, the multiple linear regression equation was as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

$$Y = 0.958 + 0.251X_1 + 0.233X_2 + 0.479X_3 + e$$

The explanation of the regression equation above was as follows:

1. The constant value of the use of agricultural machinery services (Y) was 0.958, indicating that if the variables of interest, enjoyment, and willingness were equal to 0, then the use of agricultural machinery services would be 0.958.
2. The regression coefficient of the interest variable (X_1) was 0.251, meaning that if interest increased by one unit, the use of agricultural machinery services would increase by 0.251, assuming the other independent variables remained constant. A positive coefficient indicated that interest (X_1) and the use of agricultural machinery services (Y) had a positive relationship. This meant there was a direct relationship between farmers' interest based on the indicators of accessibility, availability of agricultural machinery, and social influence on the use of agricultural machinery services.
3. The regression coefficient of the enjoyment variable (X_2) was 0.233, meaning that if enjoyment increased by one unit, the use of agricultural machinery services would increase by 0.233, assuming the other independent variables remained constant. A positive coefficient indicated that enjoyment (X_2) and the use of agricultural machinery services (Y) had a positive relationship. This meant there was a direct relationship between farmers' enjoyment based on the indicators of satisfaction and positive experiences with the use of agricultural machinery services.

4. The regression coefficient of the willingness variable (X_3) was 0.479, meaning that if willingness increased by one unit, the use of agricultural machinery services would increase by 0.479, assuming the other independent variables remained constant. A positive coefficient indicated that willingness (X_3) and the use of agricultural machinery services (Y) had a positive relationship. This meant there was a direct relationship between farmers' willingness based on the indicators of cost-benefit and access to information regarding the use of agricultural machinery services. Based on the explanation above, it was known that interest, enjoyment, and willingness had an effect on the use of agricultural machinery services.

R-square (R^2)

R-square test (R^2) in the multiple linear regression analysis was used to determine the extent of the influence of the independent variables, including the effects of the interest variable (X_1), enjoyment (X_2), and willingness (X_3) on the dependent variable which was the use of agricultural machinery services (Y). The results of the coefficient of determination test that had been conducted were as follows.

Table 11. R-square test result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.603 ^a	0.364	0.353	2.10125

Source: Primary data processing result, 2025

Based on Table 11, it was found that the Adjusted R square value was 0.353 or 35.3%. This indicated that the variables of interest (X_1), enjoyment (X_2), and willingness (X_3) were able to explain the variable of the use of agricultural machinery services (Y) by 35.3%, while the remaining 64.7% was influenced by other variables outside the study. The independent variables in this study had a smaller influence than other factors that were not the focus of this research. Other factors that were not part of the research variables included the farmers' ability to operate agricultural machinery, compatibility with needs, and farmers' income.

Hypothesis testing

The hypothesis test in this study used partial tests (t) and simultaneous tests (F) to determine the extent of the influence of each variable, both individually and collectively. The partial test (t test) was used to determine the influence of interest (X_1), enjoyment (X_2), and willingness (X_3) partially on the use of agricultural machinery services (Y). The results of the t test that had been conducted were as follows.

Table 12. Partial test result

Variable	Sig.	Description
Interest (X_1)	0.002	Significant
Enjoyment (X_2)	0.028	Significant
Willingness (X_3)	0.000	Significant

Source: Primary data processing result, 2025

1. Interest variable

Based on Table 12, it was obtained that the interest variable had a significance value of $0.002 < 0.05$, which indicated that the interest variable had a significant effect on the use of agricultural machinery services at UPJA Ngupoyo Boga. This was in accordance with the opinion of Sugiyono (2023), which stated that the determination of significance value in the t -test indicated that if the significance value was > 0.05 , then H_0 was accepted, and if the significance value was < 0.05 , then H_0 was rejected. The interest in this study was based on accessibility, availability of agricultural machinery, and social influence. The easier the access to farmers' land, the higher the farmers' interest in using agricultural machinery services. The conditions in Mulur Village showed that farmers whose land was difficult to reach or had no road access chose not to use agricultural machinery. According to Mamonto *et al.* (2020), constraints in facilities and infrastructure, such as road access for distributing agricultural machinery to farmers' locations, hindered UPJA's business. According to the conditions at the research site, farmers who wished to rent agricultural machinery from UPJA but found it unavailable would turn to other institutions or individual farmers providing agricultural machinery services. Based on the opinion of Tarigan (2018), factors causing not all farmers to use UPJA services included the inaccessibility of rental costs for farmers, the limited number of agricultural machinery, and farmers choosing to utilize traditional systems. The majority of farmers in Mulur Village used the same agricultural machinery services as other farmers on adjacent plots of land. The more frequently farmers were influenced by their social environment, the higher their interest in using agricultural machinery services. In line with Hertanto *et al.* (2019), it was explained that the social relationships among farmers mutually influenced the utilization of agricultural machinery. When the agricultural machinery available at UPJA was consistently present, and farmers had easily accessible land, along with their peers using rental services, their interest in using agricultural machinery services was also high.

2. Enjoyment variable

Based on Table 12, it was obtained that the enjoyment variable had a significance value of $0.028 < 0.05$, which indicated that the enjoyment variable had a significant effect on the use of agricultural machinery services at UPJA Ngupoyo Boga. This was in accordance with the opinion of Sugiyono (2023), which stated that the determination of significance value in the t-test indicated that if the significance value was > 0.05 , then H_0 was accepted, and if the significance value was < 0.05 , then H_0 was rejected. Referring to the research that had been conducted, the majority of farmers in Mulur Village were pleased to use UPJA's agricultural machinery services because they had previously used them and were satisfied with the services provided. In line with the opinion of Husnia & Sugiarti (2021), the satisfaction or dissatisfaction of agricultural machinery service consumers would influence their subsequent attitudes. The benefits of using agricultural machinery for rice cultivation included providing convenience for farmers. According to the findings of the research, the ease experienced by farmers in Mulur Village from using agricultural machinery included efficiency in labor, time, and costs. According to Darmawati & Ningrum (2020), farmers' satisfaction was achieved through the level of target fulfillment needed, which resulted in enjoyment. Mostly farmers in Mulur Village explained that the satisfaction UPJA from the service was due to the suitability of the work done and the farmers' desires, which made him enjoy using UPJA Ngupoyo Boga's agricultural machinery services. This was in accordance with the opinion of Ellyta *et al.* (2019), which stated that farmers' skills as operators in operating agricultural machinery influenced the results of its use.

3. Willingness variable

The results from the willingness variable showed a significance value of 0.000, indicating that the willingness variable had a significant effect on the use of agricultural machinery services at UPJA Ngupoyo Boga. This was in accordance with the opinion of Sugiyono (2023), which stated that the determination of significance value in the t-test indicated that if the significance value was > 0.05 , then H_0 was accepted, and if the significance value was < 0.05 , then H_0 was rejected. Farmers considered the comparison when using agricultural machinery and its benefits. According to Irwanto *et al.* (2023), costs and benefits, as well as economic factors, could encourage farmers to utilize agricultural machinery services, which could be seen from the perspective of expenditures and the profits obtained by farmers. This was consistent with the conditions at the research site, where farmers in Mulur Village who had used UPJA Ngupoyo Boga's agricultural machinery services had previously considered the impacts of its use. The impacts experienced included assistance for farmers, faster completion of tasks that needed to be done, and cost savings. In line with Purwantini & Susilowati (2018), access to agricultural machinery by farmers was positively influenced by costs and the quality of its performance.

The ease of access for farmers in Mulur Village to obtain information regarding the use of agricultural machinery services influenced the implementation carried out by the farmers. The reality in the field showed that farmers in Mulur Village could simultaneously use UPJA's agricultural machinery services because the Agricultural Field Extension Workers (PPL) actively provided guidance and the farmers' institutions continued to operate. According to Husnayati (2018), farmers who were closer to information access found it easier to utilize the available facilities.

Based on the research findings, the impact of interest, enjoyment, and willingness of farmers in Mulur Village on the use of agricultural machinery services at UPJA Ngupoyo Boga was an increase in the frequency of agricultural tool usage. Farmers who were interested tended to be more active in seeking information and utilizing the available access or services. The conditions in the field indicated that farmers in Mulur Village usually exchanged information related to the cultivation processes they would undertake, allowing them to utilize UPJA's agricultural machinery simultaneously. This enabled the scheduling of tool usage collectively, aiming to reduce waiting time and ensure that all farmers could access agricultural machinery according to their needs. Additionally, by collaborating, farmers could share rental costs and maximize the efficiency of tool usage, which in turn improved overall agricultural yields. The existence of UPJA Ngupoyo Boga also fostered a sense of togetherness and solidarity among farmers, strengthening agricultural institutions in Mulur Village. In accordance with the opinion of Husnayati *et al.* (2018), the government's efforts to enhance food security were implemented through the establishment of UPJA as a business unit for farmer groups (poktan) or joint farmer groups (gapoktan).

The simultaneous test (F test) was used to determine the simultaneous influence of interest (X_1), enjoyment (X_2), and willingness (X_3) on the use of agricultural machinery services (Y). The F test was conducted using ANOVA to assess the extent of the influence of the independent variables simultaneously on the dependent variable. The results of the simultaneous test that had been conducted were as follows.

Table 13. Simultaneous test result

Model	Sum of Squares	df	Mean Square	Fhitung	Ftabel	Sig.
Regression	457.078	3	152.359	34.507	2.65	.000 ^b
Residual	799.160	181	4.415			
Total	1256.238	184				

Source: Primary data processing result, 2025

Based on Table 13, it was found that the calculated F value was 34.507 with a significance value of 0.000. This result indicated that the calculated F was greater than the table F value, with $34.507 > 2.65$, and the significance value was less than 0.05, leading to the rejection of H_0 , which meant that the variables of interest (X1), enjoyment (X2), and willingness (X3) simultaneously influenced the use of agricultural machinery services (Y). This was in accordance with the opinion of Sugiyono (2023), which stated that if the significance value ($\text{Sig} \leq 0.05$), then the independent variables had a simultaneous effect on the dependent variable.

These independent variables were able to influence the use of agricultural machinery services by farmers at UPJA Ngupoyo Boga. The simultaneous influence indicated that the farmers' interest was not affected by factors standing alone. Rather, the indicators of interest, such as interest, enjoyment, and willingness, were integrated with one another. The conditions in the field showed that the use of agricultural machinery services by farmers in Mulur Village was influenced by the continuity between interest, enjoyment, and willingness. These three variables supported each other and contributed to the farmers' decision to use the agricultural machinery services of UPJA Ngupoyo Boga. This was consistent with the analysis results, which showed that these variables simultaneously influenced the use of agricultural machinery services.

CONCLUSION

The results of this research had several important implications for the development of agriculture in Mulur Village and the management of agricultural machinery services by UPJA Ngupoyo Boga. First, the understanding of the factors that influenced farmers' interest in using agricultural machinery services could help UPJA design more effective programs and strategies to increase farmer participation, especially by considering aspects such as gender, age, education level, and farming experience. Second, the research findings indicated that the variables of interest, enjoyment, and willingness had a significant effect on the use of agricultural machinery services. Therefore, the recommendations from this research were that the management of UPJA Ngupoyo Boga needed to establish a routine schedule for the maintenance of functioning agricultural machinery and conduct a recent inventory of all machinery. Furthermore, it was hoped that they could prepare a detailed budget for repairing damaged machinery by recording and identifying each type of damage so that the costs for repairs could be planned. Additionally, the government needed to conduct a survey to identify the types of additional machinery required by farmers.

ACKNOWLEDGEMENT

The researcher would like to express sincere gratitude to Diponegoro University, Faculty of Animal and Agricultural Science for the educational facilities and the Department of Agriculture and Fisheries of Sukoharjo Regency especially BPP Bendosari District for the assistance provided, which enabled the researcher to successfully complete this research.

REFERENCES

- Adiarsi, A., Anantanyu, S., & Wijianto, A. (2020). Partisipasi petani dalam program kluster pertanian modern di Kecamatan Tawang Sari, Kabupaten Sukoharjo. *Agritexts*, 44(1), 57–65.
- Alawiyah, T., Sumantri, A. T., & Gunawan, G. (2018). Tingkat partisipasi petani dalam program perluasan areal tanam (PAT) kedelai (*Glycine max*). *Agribisnis Terpadu*, 11(2), 168–180.
- Amghani, M. S., Miladi, H., Savari, M., & Mojtahedi, M. (2025). Factors influencing the agricultural extension model sites in Iran. *Scientific Reports*, 15(9590), 1–20. <https://doi.org/10.1038/s41598-025-94151-6>
- Bachri, M. R., Lubis, Y., & Harahap, G. (2019). Faktor-faktor yang mempengaruhi adopsi inovasi teknologi oleh petani padi sawah di Desa Kolam Kecamatan Percut Sei Tuan. *Ilmiah Pertanian*, 1(2), 175–186.
- BPS. (2019). *Luas lahan sawah menurut kecamatan dan jenis pengairan (hektar), 2016–2018*. Badan Pusat Statistik. <https://sukoharjokab.bps.go.id/id/statistics-table/2/MTQ0lzl=/luas-lahan-sawah-menurut-kecamatan-dan-jenis-pengairan.html>
- BPS. (2023). *Hasil pencacahan lengkap sensus pertanian 2023 – tahap I*. Badan Pusat Statistik. <https://www.bps.go.id/id/pressrelease/2023/12/04/2050/hasil-pencacahan-lengkap-sensus-pertanian-2023---tahap-i.html>
- BPS. (2023). *Kecamatan Bendosari dalam angka 2023*. Badan Pusat Statistik Kabupaten Sukoharjo.
- BPS. (2024). *Luas panen, produksi dan produktivitas padi menurut kabupaten/kota di Provinsi Jawa Tengah (kuintal/hektar) 2021–2023*. Badan Pusat Statistik. <https://jateng.bps.go.id/id/statistics-table/2/NDYzIzl=/luas-panen-produksi-dan-produktivitas-padi-menurut-kabupaten-kota-di-provinsi-jawa-tengah.html>
- Darmawati, D., & Ningrum, P. P. A. (2020). Kepuasan petani terhadap pelayanan penyuluh pertanian dalam aktivitas penyuluhan pertanian di Kabupaten Banyuwangi. *Societa*, 9(2), 55–63.
- Direktorat Jenderal Prasarana dan Sarana Pertanian. (2022). *Statistik prasarana dan sarana pertanian 2017–2021*. Kementerian Pertanian Republik Indonesia.

- Ellyta, M., Mulyati, H. M., Kurniawan, & Ekawati. (2019). Aspek pengetahuan, sikap dan keterampilan pada respon petani terhadap UPJA di Kecamatan Toho. *SEA*, 8(2), 13–22.
- Faradisi, F. N., Prayoga, K., & Prasetyo, A. S. (2023). Komparasi persepsi petani terhadap eksistensi kelompok tani dan gabungan kelompok tani di Desa Bedono. *Ekonomi Pertanian dan Agribisnis*, 7(2), 833–847. <https://doi.org/10.21776/ub.jepa.2023.007.02.34>
- Fitriana, H. N., Lestari, E., & Suminah. (2022). Faktor-faktor yang mempengaruhi pengambilan keputusan petani bawang putih dalam menjalin kemitraan. *Agritexts*, 46(1), 69–80. <https://doi.org/10.20961/agritexts.v46i1.61412>
- Fitriyana, I., Hasanuddin, T., Syarif, Y. A., & Gitosaputro, S. (2023). Penggunaan alsintan dan produktivitas usahatani padi sawah. *Ekonomi Pertanian dan Agribisnis*, 7(2), 573–578. <https://doi.org/10.21776/ub.jepa.2023.007.02.13>
- Gusti, I. M., Gayatri, S., Subhan, A., & Tani, K. (2021). Pengaruh umur, tingkat pendidikan, dan lama bertani terhadap pengetahuan petani mengenai kartu tani. *Litbang*, 19(2), 209–221. <https://doi.org/10.36762/jurnaljateng.v19i2.926>
- Hantoro, F. R. P., Prasetyo, E., & Hermawan, A. (2020). Dampak penggunaan alat dan mesin pertanian terhadap produksi. *Pangan*, 29(3), 171–180.
- Hertanto, D., Fadwiwati, A. Y., Hipi, A., & Anasiru, R. (2019). Persepsi petani terhadap teknologi jarwo transplanter. *Agrovital*, 4(2), 38–46.
- Husnayati, L. G., Suwanto, & Ihsaniyati, H. (2018). Persepsi petani terhadap UPJA di Kecamatan Tawang Sari. *Agritexts*, 42(1), 31–47.
- Husnia, R., & Sugiarti, T. (2021). Penilaian kepuasan dan citra UPJA di Desa Dlemer. *Agriscience*, 2(1), 148–164.
- Idaryani, A., Suddin, A. F., Rauf, A. W., & Syam, A. (2021). Pengaruh pemupukan NPK terhadap pertumbuhan dan hasil padi. *Pengkajian dan Pengembangan Teknologi Pertanian*, 24(2), 137–150.
- Indrayanti, T., Prayoga, A., & Zakky, M. (2024). Penggunaan alsintan pada pertanian modern. *Ketahanan Nasional*, 30(2), 258–274. <http://dx.doi.org/10.22146/jkn.97632>
- Irwanto, A., Prayoga, A., Mahfud, K., & Indrayanti, T. (2023). Analisis persepsi petani terhadap UPJA. *Penyuluhan Pertanian*, 18(1), 10–18.
- Kadir, K., & Prasetyo, O. R. (2023). GAP produktivitas menurut gender pada petani padi di Indonesia. *Proceedings of the National Seminar on Official Statistics, 2023*(1), 139–150.
- Kharismawati, K. H. D., & Karjati, P. D. (2021). Pengaruh luas lahan dan tenaga kerja terhadap produksi padi. *Economie*, 3(2), 146–162.
- Made, N., Zeamita, N., & Baga, L. M. (2016). Kinerja usahatani dan motivasi petani dalam inovasi varietas jagung hibrida. *Penyuluhan*, 12(1), 31–42.
- Mamonto, W. S., Osak, R. E. M. F., & Kalangi, J. K. J. (2020). Strategi pengembangan UPJA. *Agri-SosioEkonomi Unsrat*, 16(3), 457–468.
- Mayrowani, H., & Pranadji, T. (2012). Pola pengembangan kelembagaan UPJA. *Analisis Kebijakan Pertanian*, 10(4), 347–360.
- Peraturan Menteri Pertanian. (2008). *Pedoman penumbuhan dan pengembangan usaha pelayanan jasa alat dan mesin pertanian nomor 25 tahun 2008*. <https://psp.pertanian.go.id/storage/582/Peraturan-Menteri-Pertanian-Nomor-25-Tahun-2008-tentang-Pedoman-Penumbuhan-dan-Pengembangan-Usaha-Pelayanan-Jasa-Alat-dan-Mesin-Pertanian.pdf>
- Prayoga, K., & Yuliati, Y. (2015). Women farmers respond about rice barn village program. *Habitat*, 26(1), 10–21.
- Purwantini, T. B., & Susilowati, S. H. (2018). Dampak penggunaan mesin panen terhadap kelembagaan usahatani padi. *Analisis Kebijakan Pertanian*, 16(1), 73–88. <http://dx.doi.org/10.21082/akp.v16n1.2018.73-88>
- Puspita, Y. H., Sugihardjo, & Suwanto. (2023). Hubungan karakteristik petani dengan adopsi inovasi OPIP padi 400. *Agritexts*, 47(1), 45–55. <https://doi.org/10.20961/agritexts.v47i1.70474>
- Rangkuti, F. (1997). *Riset pemasaran*. Gramedia Pustaka Utama.
- Saleleng, M., & Soegoto, A. S. (2015). Pengaruh lingkungan kerja dan motivasi terhadap kinerja pegawai. *EMBA*, 3(3), 695–708.
- Simatupang, J. T., Hutapea, K. P., & Aguaninta, D. S. (2021). Analisis pengaruh faktor produksi terhadap produksi bawang merah. *Penelitian Bidang Ilmu Pertanian*, 19(2), 37–45.
- Sraboni, E., Malapit, H. J., Quisumbing, A. R., & Ahmed, A. U. (2014). Women's empowerment in agriculture and food security in Bangladesh. *World Development*, 61, 11–52. <http://dx.doi.org/10.1016/j.worlddev.2014.03.025>
- Sudewi, S., Ala, A., Baharuddin, & Farid, M. (2020). Keragaman OPT pada varietas unggul baru dan lokal. *Agrikultura*, 31(1), 15–24.
- Sugiyono. (2023). *Metode penelitian kuantitatif kualitatif dan R&D*. Alfabeta.
- Sugiyono. (2023). *Statistika untuk penelitian*. Alfabeta.
- Sujarweni, W. V. (2023). *Metodologi penelitian lengkap praktis dan mudah dipahami*. Pustaka Baru Press.
- Sungkawa, I. (2014). Kajian proporsi keterlibatan perempuan dalam usaha tani padi. *ComTech*, 5(2), 860–869.
- Tarigan, H. (2018). Mekanisasi pertanian dan pengembangan UPJA. *Forum Penelitian Agro Ekonomi*, 36(2), 117–128.
- Undang-Undang Republik Indonesia. (2003). *Undang-undang nomor 20 tahun 2003 tentang sistem pendidikan nasional*. <https://peraturan.bpk.go.id/Details/43920/uu-no-20-tahun-2003>

Wirayuda, I. D. G. A., & Arka, S. (2024). Pengaruh modal, pengalaman dan pendidikan terhadap produktivitas petani padi. *Review Pendidikan dan Pengajaran*, 7(3), 10463–10473.