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Assessing the adoption of specialized rice production technology in selected towns of Nueva Ecija

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ABSTRACT
This study assesses the adoption of special rice production (SPR) technology among rice farmers in selected towns of Nueva Ecija. Specifically, it examined the influence of socio-demographic factors and extension services on the perceived attributes of the technology. Using a survey research design, interviews were guided by a semi-structured questionnaire. Farmers showed strong positive perceptions and high adoption of special rice production (SPR). Adoption was significantly influenced by age, farming experience, institutional support, and favorable technology traits. Regression analysis indicated that gross income and water source positively impacted adoption, while farm size, training services, and perceived relative advantage had negative effects. The extension services from CLSU play a significant role in facilitating the adoption of SPR technology. However, challenges related to the costs and complexities of the technology, as well as unexpected negative effects on training, highlight areas for improvement. Future efforts should focus on addressing these challenges, ensuring that economic and practical barriers do not hinder the widespread adoption and successful implementation of special purpose rice production technology. This study provides insights for policymakers and stakeholders to develop strategies for wider adoption of SPR technology.

Contribution/Originality: This study offers vital baseline data on the factors influencing farmers' adoption of special-purpose rice (SPR). Amid challenges in the rice industry, it highlights the high market value and income potential of SPR, positioning it as a promising alternative to improve farmers' livelihoods through technology-driven cultivation strategies.

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1. INTRODUCTION
The agricultural sector in the Philippines, particularly rice production, plays a pivotal role in ensuring food security and providing livelihoods for millions of farmers. Nueva Ecija, known as the "Rice Granary of the Philippines," is at the forefront of rice cultivation and innovation.

In recent years, rice production technologies have been introduced to enhance productivity, improve sustainability, and increase profitability for farmers. These technologies encompass a range of practices, including improved seed varieties, precision farming techniques, and integrated pest and nutrient management systems.

The adoption of special rice production technology is influenced by multiple factors, including socio-demographic characteristics of the farmers, their educational background, access to resources, and support from agricultural extension services. Understanding the levels of adoption and the factors that drive or hinder it is critical for designing effective interventions and policies that promote the widespread use of these technologies.

This study aimed to assess the adoption levels of special rice production technology among farmers in selected towns of Nueva Ecija. By examining the socio-demographic profiles of the farmers, their farm management practices, and the extent to which they integrated special rice production technologies into their farming operations, the research sought to identify the key determinants of adoption. Additionally, the study explored the perceived benefits and challenges faced by farmers in implementing these technologies.

The findings of this research will provide valuable insights for policymakers, agricultural extension workers, and other stakeholders involved in promoting agricultural innovation. By highlighting the factors that contribute to successful adoption, the study aims to support efforts to enhance the productivity and profitability of rice farming in Nueva Ecija, ultimately contributing to the broader goals of food security and rural development in the Philippines.

1.1. Specific Objectives of the Study

1. Describe the farmers' perceived adequacy of extension services and technology attributes in terms of relative advantage, compatibility, trialability, and observability.
2. Evaluate the relationships among socio-demographic and economic characteristics, extension services, and technology attributes to the level of adoption of special rice production technology.
3. Assess the level of adoption of farmers regarding the special rice production technology protocol.

2. LITERATURE REVIEW

2.1. Status of Special Rice in Nueva Ecija

According to the Philippine Rice Research Institute, there are 13,286 kinds of traditional varieties of specialty rice, and this number continues to grow. Pigmented rice, such as black rice, red rice, violet rice, and pink rice, as well as aromatic rice like Jasmine and Basmati rice, are popular varieties of specialty rice in Nueva Ecija. Presently, particularly in this modern generation of our society, people are more aware and sensible about consuming healthy and nutritious foods, which has led to specialty rice becoming more popular and accepted in the market worldwide (Provincial Commodity Investment Plan (PCIP), 2020).

2.2. Factors Affecting Adoption

Melesse (2018) cited that the age and education of the household head are other variables explaining farmers' behavior in technology adoption, which play an important role by influencing farmers' access to information and shaping their ability to convert the available information into action.

Farid, Tanny, and Sarma (2015) found that in the adoption of improved farm practices, age, farmers' level of education, training status, communication score, and landholding were found to be insignificant in the adoption of farm practices.

On the other hand, younger farmers have a higher propensity to adopt technologies than older farmers (Dhraief et al., 2019).

Farmers with larger holdings are more likely to adopt agricultural technologies compared to those with smaller plots (Kasirye, 2013). Similarly, adopters were found to have larger cultivable land sizes compared to non-adopters (Mugisha, 2004). Meanwhile, the size of the labor force is statistically not significant and has no impact on the decision to adopt innovative technology. This seems to be explained by the fact that farmers do not need a large labor force, especially for mechanized technologies (Dhraief et al., 2019).

Dhraief et al. (2019) found that farmers with livestock experience are significantly but negatively correlated with the adoption decision in livestock production.

Melesse (2018) cited institutional factors, particularly services for agricultural development, to enhance farmers' access to productive inputs and product markets, such as facilities, mechanisms, and information dissemination, which deal with the extent of institutional impact on technology adoption by smallholders.

Dhraief et al. (2019) found that the extension services were significant and positively correlated with the adoption decision.

Farid et al. (2015) stated that involvement with cooperative societies and NGO affiliations do not have a significant relationship with adoption. In contrast, for association members, these are significant factors that positively influence the adoption decision (Dhraief et al., 2019). According to Silva and Broekel (2016), farmers who participate in associations and cooperatives have more experience, which influences the adoption of technologies such as Precision Agriculture Technology (PAT). They also found that farmers with greater access to sources of information about PAT are more likely to adopt new technologies due to increased awareness of the impact of PAT adoption on farm businesses.

It is the utilization of different communication channels of mature technology or innovation in farming practices and methods for effective extension services through farmers' training, technology demonstration, use of IEC materials, mobile applications, and online platforms to reach a wider audience (David, 2018).

2.3. Technology Characteristics Facilitating Adoption

The degree of adoption of any innovative technology depends largely on its characteristics. There are five characteristics that affect the rate at which an innovation is adopted: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). Literature proposes that innovations which are perceived by individuals as having greater relative advantage, compatibility, trialability, observability, and less complexity will have a greater adoption rate than other innovations (Ghane, Samah, Ahmad, & Idris, 2011).

To Mwangi (1998), because farmers want to make money, how a new technology will benefit them financially must be shown to them. The relative advantage of Integrated Pest Management (IPM) practices found that additional IPM practices provide benefits such as economic profitability, decreased production costs, reduced discomfort, social prestige, and time and effort savings that influence farmers' decisions (Ghane et al., 2011).

In previous studies, compatibility appears to have a significant impact on technology adoption (Ghane et al., 2011).

Technologies that can be tried on a limited scale will be adopted faster due to their lower risk to the adopter (Mwangi, 1998). In addition, technologies that are more complex to understand and use have lower rates of adoption (Mwangi, 1998). Finally, material innovations and concrete ideas that are easily observable are adopted faster than less concrete ones (Mwangi, 1998).

3. METHODOLOGY

3.1. Population and Sampling Procedure

Table 1 presents the population of this study which included farmers who planted special purpose rice in five municipalities of Nueva Ecija. A complete enumeration of 33 farmer adopters who participated in the training conducted by the CLSU-UEPO was selected as respondents.

Table 1. Location and distribution of the respondents of the study.

No.	Municipalities	Number of farmers	Percentage
1	Guimba	5	15.2
2	Licab	11	33.3
3	Science City of Muñoz	8	24.2
4	Sto. Domingo	1	3
5	Talavera	8	24.2
	Total	33	100

3.2. Data Gathering Procedure

The primary data were acquired from the number of farmers who adopted the technology for special-purpose rice production (CLS 2) through a survey using a structured interview schedule. Other data were obtained from key informants through surveys and key informant interviews using questionnaires. The data needed for the study were gathered from farmer respondents of special rice technology in Nueva Ecija.

The secondary data were obtained from the CLSU-University Extension Program Office. The special rice production technology was guided by secondary materials such as recommended technology protocols for the special rice techno-demonstration and the techno-guidebook from CLSU technical experts.

The researcher sent a request letter to all municipal mayors through the Municipal Agriculturist Office (MAO) for assistance and permission to interview respondents before conducting primary data collection.

3.3. Methods of Data Analysis

The data were analyzed using the Statistical Package for Social Science (SPSS). Descriptive statistics such as mean, standard deviation, range, frequency, and percentage were used to describe the farmers' perceived adequacy of extension services, and technology attributes in terms of relative advantage, compatibility, triability, and observability. In this study, regression and Pearson correlation were utilized to analyze the relationships between the variables. Multiple regression analysis was used to identify the factors that influence the level of adoption of the farmers. Additionally, Pearson correlation was used to assess the strength and direction of linear relationships between pairs of continuous variables, providing insight into their associations.

Linear regression model with one independent variable can be expressed as:

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$$

Where,

y_i is the dependent variable (Level of adoption).

x_i is the independent variable (Individual, institutional and technology factors).

β_0 is the intercept, representing the value of y when x is zero.

β_1 is the slope, representing the change in y for a one-unit change in x.

ε_i is the error term, representing the difference between the predicted value of y and the actual value of y for each observation.

The Pearson correlation coefficient is denoted by the letter "r". The formula for Pearson correlation coefficient r is given by.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where,
r = Pearson correlation coefficient.
x = Values in the first set of data.
y = Values in the second set of data.
n = Total number of values.

4. RESULTS AND DISCUSSION

4.1. Training Services in Relation to Special Rice

Table 2 presents the training services attended by the respondents in relation to special rice. The majority of 25 farmer-respondents (75.8%) had attended training related to special rice, while 8 respondents (24.2%) did not participate in any training.

The training sessions covered two main topics: Agro Enterprise Clustering Approach on Special Purpose Rice, attended by 19 respondents (76%), and Organic Farming of Rice Production, attended by 6 respondents (24%).

The majority of training occurred in 2022, with 14 respondents (52%) attending. All training sessions lasted for 2 days, indicating a consistent duration across all training events for the 25 respondents (100%). The majority of the training was conducted by CLSU.

The training sessions were held in four locations: Talavera (9 respondents or 36%), Guimba (6 respondents or 24%), and Cabisuculan and Licab (5 respondents each, or 20%).

The training services related to special rice showed a high level of participation, with 75.8% of respondents having attended at least one training session. The predominant focus of these trainings was on the Agro-Enterprise Clustering Approach for Special Purpose Rice.

Training services play a crucial role in the adoption of farming innovations by improving knowledge, skills, confidence, and economic understanding among farmers. Effective training can lead to increased adoption rates and better overall farm productivity (Feder, Just, & Zilberman, 1985).

This data highlights the extensive and structured training efforts aimed at enhancing special rice production practices among the respondents.

Table 2. Training services in relation to special rice.

Variable	Frequency	Percentage
Training attended		
No	8	24.2
Yes	25	75.8
No. of training attended		
0	8	24.2
1	25	75.8
Mean	*1*	
Training title		
Agro enterprise clustering approach on SPR	19	76
Organic farming of rice production	6	24
Year of the training		
2018	1	4
2020	7	28
2021	2	8
2022	14	56
2023	1	4
Venue		
Cabisuculan	5	20
Guimba	6	24
Licab	5	20
Talavera	9	36
Duration (No. of days)		
2	25	100
Conducted by		
CLSU	24	96
Gracia Plena	1	4

4.2. Information Services in Relation to Special Rice

Table 3 provides an overview of the information services related to special rice that respondents utilized, detailing the sources and modes of information received.

The respondents obtained information from various sources. The most common source of information was obtained from CLSU by 14 respondents (42.4%), and other sources through Co-Farmers (24.2%), LGU Extension Workers (12.1%), and the Barangay Council for Agriculture (21.2%). The majority of respondents received information through interpersonal means of communication by 28 respondents (84.8%), while the other 5 respondents (15.2%) received it through print media. It can be seen that farmer respondents are more likely to trust information received from reliable institutions, extension workers, and fellow farmers whom they know personally.

This indicates a strong reliance on direct communication and trust in disseminating information on special rice production practices among the respondents. It is shown that the interpersonal mode of information services is key in diffusing innovations (Rogers, 2003) and farmers with greater access to the source of information are more likely to adopt new technology (Silva & Broekel, 2016).

Table 3. Information services in relation to special rice.

Variable	Frequency	Percentage
Source of information		
Co-farmers	8	24.2
Lgu extension workers	4	12.1
Clsu personnel	14	42.4
Barangay council for agriculture	7	21.2
Mode of information received		
Print media	5	15.2
Interpersonal	28	84.8

4.3. Technical Assistance Services in Relation to Special Rice

Table 4 provides insights into the technical assistance services related to special rice, detailing the frequency, sources, and types of assistance received by respondents.

Respondents received technical assistance with varying frequencies. The most common frequency of technical assistance was once a month, reported by 12 respondents (36.4%). All respondents (100%) received technical assistance from CLSU. The type of technical assistance received by the majority of 24 respondents (72.7%) covers both the production and marketing aspects of special rice. This indicates that the frequency of technical assistance is indeed critical for farm production, which ensures a significant effect on productivity and income (Abbeam, Wiredu, Asante, & Al-Hassan, 2018).

The technical assistance services for special rice are predominantly sourced from CLSU, ensuring a consistent and centralized provision of expertise.

Most respondents receive monthly assistance, primarily focusing on both production and marketing aspects of special rice. This comprehensive support framework highlights CLSU's crucial role in enhancing the technical capabilities and market integration of special rice farmers.

Table 4. Technical assistance services in relation to special rice.

Variable	Frequency	Percentage
Frequency of technical assistance		
Once a month	12	36.4
Twice a month	7	21.2
Once in 2 months	10	30.3
Twice in 3 months	2	6.1
Twice a year	2	6.1
Source		
CLSU	33	100.0
Kind of technical assistance		
Planting methods & marketing	1	3.0
Production	1	3.0
Production & marketing	24	72.7
Source of seeds, production & marketing of SPR	1	3.0
No answer	6	18.2

Note: Multiple response.

4.4. Technology Factors (Perceived Attributes of Technology)

Table 5 presents the perceived attributes of special purpose rice. The SPR technologies have one recommended production protocol. Respondents were asked about the SPR's perceived technology attributes in terms of relative advantage, compatibility, complexity, trialability, and observability. These attributes were rated on a five-point rating scale as shown below.

Table 5. Perceived attributes of special purpose rice.

Mean range	Relative advantage	Compatibility	Complexity	Triability	Observability
5.00 - 4.24	Very relevant (VR)	Very compatible (VC)	Very easy (VE)	Very High (VH)	Very visible (VV)
4.23 - 3.43	Relevant (R)	Compatible (C)	Easy (E)	High (H)	Visible (V)
3.42 - 2.62	Moderately relevant (MR)	Moderately compatible (MC)	Moderately easy (ME)	Medium (M)	Moderately visible (MV)
2.61 - 1.81	Less relevant (LR)	Less compatible (LC)	Less easy (LE)	Low (L)	Less visible (LV)
1.80 -1.00	Not relevant (NR)	Not compatible (NC)	Not easy (NE)	Very low (VL)	Not visible (NV)

Relative Advantage: Table 6 shows the perceived relative advantage, indicating a very relevant result with an overall rating of 4.43. The majority of the respondents rated the 31 production technology protocols as very relevant (VR), and only 7 out of 31 were rated relevant (R).

The production technologies rated relevant are: a) Soak the seeds (40 kg/ha) with fungicide for 24 hours (4.21), b) Broadcast 2 bags of organic fertilizer in a 400 m² seedbed area (3.97), c) At the last harrowing, apply organic fertilizer at 20 bags per hectare (3.94), d) Broadcast a mix of Urea (3 bags) & 14-14-14 (4 bags) during the wet season (4.09), e) Organic fertilizers (3.79), f) Rouging is done (4.06), and g) As possible, dry harvest rice continuously for 3 hours per day to meet 14% moisture content and to preserve the aromatic scent (4.12).

This indicates that the extension workers or technical experts must emphasize to the special rice farmers the advantages and benefits of the seven technologies. Special rice farmers must be encouraged to fully utilize the technology protocol to enhance better economic profitability by adopting additional new farm practices to lessen production costs while improving the quality of produce that will increase farmers' income. Roughing is very important in terms of the purity of paddy rice seeds; the application of organic fertilizers must be enhanced to improve soil fertility. The use of fungicide during seed germination is highly recommended to lessen the contamination of fungus and increase the seed germination rate. The application of paclobutrazol is needed to strengthen the stems of rice to prevent lodging during the wet season. Maintaining the recommended moisture content of rice seeds at 14% is important during post-harvest management to maintain the quality of special rice.

Table 6. Relative advantage of the special rice production technology.

Perceived relative advantage of special Rice production technology	Mean rating	Description
1. Variety used		
a. CLS 2	4.42	VR
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	4.42	VR
b. Submerge the area with water for 2-3 days	4.55	VR
c. Plow the soil with water level of 2-3 cm and harrow	4.55	VR
d. Prepare plots measuring 1.5 meters width	4.55	VR
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	4.21	R
b. Drain seeds after 24 hours and incubate for 24 hours	4.67	VR
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m² seedbed area	3.97	R
b. Sow seeds with enough water level and drain it in the next morning	4.61	VR
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	4.70	VR
5. Land preparation		
a. Plow field at 10 cm depth	4.61	VR
b. Harrow field 2-3 weeks before transplanting	4.73	VR
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	3.94	R
d. Cultivate and level the soil one day before transplanting	4.64	VR
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	4.42	VR
b. Plant 2-3 seedlings per hill at distance of 20x20cm	4.70	VR

Perceived relative advantage of special Rice production technology	Mean rating	Description
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	4.67	VR
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	4.61	VR
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	4.67	VR
b. Broadcast mix Urea (3 bags) & 14-14-14 (4 bags) during wet season	4.09	R
c. Broadcast mix Urea (4 bags) & 14-14-14 (6 bags) during dry season	4.58	VR
d. Organic Fertilizers	3.79	R
9. Pest and disease management		
a. Use pesticide if needed	4.55	VR
b. Use pesticide for snail 1-3 days after transplanting	4.64	VR
c. Spray paclobutrazol to strengthen rice plant	3.39	MR
Perceived relative advantage of special	Mean rating	Description
10. Weed management and rouging		
a. Spray weed control if needed	4.36	VR
b. Rouging is done	4.06	R
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	4.67	VR
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	4.73	VR
c. Harvest using combine harvester	4.82	VR
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content and to preserve aromatic scent	4.12	R
Overall mean rating	4.43	VR

Note:	Mean range	Description
	5.00 - 4.24	Very relevant (VR)
	4.23 - 3.43	Relevant (R)
	3.42 - 2.62	Moderately relevant (MR)
	2.61 - 1.81	Less relevant (LR)
	1.80 -1.00	Not relevant (NR)

Compatibility: Table 7 shows the perceived compatibility of Special Rice Production technology. The overall mean rating was 4.42, indicating that the technology was very compatible. The majority of the farmer respondents rated the 31 production technologies as very compatible; 7 out of 31 were rated compatible, and 1 out of 31 was rated moderately compatible.

The production technology with compatible ratings are: a) Prepare 400 m2 seedbed area at 21-25 days before transplanting (4.21), b) Soak the seeds (40kg/ha) with fungicide for 24 hours (4.15), c) Broadcast 2 bags of organic fertilizer in 400 m2 seedbed area (4.03), d) Broadcast a mix of Urea (3 bags) & 14-14-14 (4 bags) during the wet season (4.06), e) Organic Fertilizers (3.82), f) Rouging is done (4.18), and g) As possible, dry harvest rice continuously for 3 hours per day to meet 14% moisture content and to preserve aromatic scent (4.21). The spray of paclobutrazol to strengthen the rice plant was rated moderately compatible (3.36).

This implies that the perceived attributes of technology among farmer respondents regarding their farming experience or existing farming practices are almost the same as those of special rice production farm practices.

Table 7. Compatibility of the special rice production technology.

Perceived compatibility of special Rice production technology	Mean rating	Description
1. Variety used		
a. CLS 2	4.36	VC
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	4.21	C
b. Submerge the area with water for 2-3 days	4.39	VC
c. Plow the soil with water level of 2-3 cm and harrow	4.42	VC
d. Prepare plots measuring 1.5 meters width	4.36	VC
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	4.15	C
b. Drain seeds after 24 hours and incubate for 24 hours	4.48	VC
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m² seedbed area	4.03	C
b. Sow seeds with enough water level and drain it in the next morning	4.58	VC
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	4.67	VC
5. Land preparation		

Perceived compatibility of special Rice production technology	Mean rating	Description
a. Plow field at 10 cm depth	4.52	VC
b. Harrow field 2-3 weeks before transplanting	4.73	VC
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	4.27	VC
d. Cultivate and level the soil one day before transplanting	4.82	VC
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	4.64	VC
b. Plant 2-3 seedlings per hill at distance of 20x20cm	4.76	VC
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	4.70	VC
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	4.58	VC
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	4.48	VC
b. Broadcast mix urea (3 bags) & 14-14-14 (4 bags) during wet season	4.06	C
c. Broadcast mix urea (4 bags) & 14-14-14 (6 bags) during dry season	4.52	VC
d. Organic fertilizers	3.82	C
9. Pest and disease management		
a. Use pesticide if needed	4.55	VC
b. Use pesticide for snail 1-3 days after transplanting	4.73	VC
Perceived compatibility of special rice production technology	Mean rating	Description
c. Spray paclobutrazol to strengthen rice plant	3.36	MC
10. Weed management and rouging		
a. Spray weed control if needed	4.48	VC
b. Rouging is done	4.18	C
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	4.55	VC
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	4.73	VC
c. Harvest using combine harvester	4.73	VC
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content and to preserve aromatic scent	4.21	C
Overall mean rating	4.42	VC

Note:	Mean range	Description
	5.00 - 4.24	Very compatible (VC)
	4.23 - 3.43	Compatible (C)
	3.42 - 2.62	Moderately compatible (MC)
	2.61 - 1.81	Less compatible (LC)
	1.80 -1.00	Not compatible (NC)

Complexity: Table 8 shows the perceived complexity of special rice production technology. The overall mean rating was 4.44, indicating that it is very easy to use. The majority of the respondents rated the 31 production technologies as very easy; 6 out of 31 were rated easy, and 1 out of 31 was rated moderately easy.

The production technology rated easy) includes: a) Soak the seeds (40kg/ha) with fungicide for 24 hours (4.15), b) Broadcast 2 bags of organic fertilizer in a 400 m² seedbed area (3.85), c) At the last harrowing, apply organic fertilizer at 20 bags per hectare (4.03), d) Broadcast a mix of Urea (3 bags) & 14-14-14 (4 bags) during the wet season (4.06), e) Organic Fertilizers (3.82), and f) Rouging is performed (4.21). Spray paclobutrazol to strengthen the rice plant, which is rated as moderately easy. This implies that the SR production technology is easy to use and understand.

Table 8. Complexity of the special rice production technology.

Perceived complexity of special Rice production technology	Mean rating	Description
1. Variety used		
a. CLS 2	4.45	VE
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	4.36	VE
b. Submerge the area with water for 2-3 days	4.48	VE
c. Plow the soil with water level of 2-3 cm and harrow	4.55	VE
d. Prepare plots measuring 1.5 meters width	4.58	VE
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	4.15	E
b. Drain seeds after 24 hours and incubate for 24 hours	4.52	VE

Perceived complexity of special Rice production technology	Mean rating	Description
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m^2 seedbed area	3.85	E
b. Sow seeds with enough water level and drain it in the next morning	4.52	VE
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	4.64	VE
5. Land preparation		
a. Plow field at 10 cm depth	4.55	VE
b. Harrow field 2-3 weeks before transplanting	4.70	VE
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	4.03	E
d. Cultivate and level the soil one day before transplanting	4.91	VE
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	4.76	VE
b. Plant 2-3 seedlings per hill at distance of 20x20cm	4.64	VE
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	4.79	VE
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	4.61	VE
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	4.61	VE
b. Broadcast mix urea (3 bags) & 14-14-14 (4 bags) during wet season	4.06	E
c. Broadcast mix urea (4 bags) & 14-14-14 (6 bags) during dry season	4.42	VE
d. Organic fertilizers	3.82	E
9. Pest and disease management		
a. Use pesticide if needed	4.45	VE
b. Use pesticide for snail 1-3 days after transplanting	4.61	VE
Perceived complexity of special rice production technology	Mean rating	Description
c. Spray paclobutrazol to strengthen rice plant	3.39	ME
10. Weed management and rouging		
a. Spray weed control if needed	4.36	VE
b. Rouging is done	4.21	E
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	4.76	VE
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	4.79	VE
c. Harvest using combine harvester	4.82	VE
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content	4.12	E
Overall mean rating	4.44	VE

Note:	Mean range	Description
	5.00 - 4.24	Very easy (VE)
	4.23 - 3.43	Easy (E)
	3.42 - 2.62	Moderately easy (ME)
	2.61 - 1.81	Less easy (LE)
	1.80 -1.00	Not easy (NE)

Triability: Table 9 shows the perceived triability. With an overall mean rating of 4.27, triability was rated very highly. The majority of the respondents rated the 31 production technologies as very high; 7 out of 31 were rated high, and only 1 out of 31 was rated medium.

The production technology rated high (h) includes: a) soaking the seeds (40kg/ha) with fungicide for 24 hours (4.09), b) broadcasting 2 bags of organic fertilizer in a 400 m^2 seedbed area (3.91), c) at the last harrowing, applying organic fertilizer at 20 bags per hectare (4.00), d) broadcasting a mix of urea (3 bags) & 14-14-14 (4 bags) during the wet season (3.94), e) using organic fertilizers (3.73), f) performing rouging (4.18), and g) if possible, dry harvesting rice continuously for 3 hours per day to meet 14% moisture content and preserve the aromatic scent (4.15). The spray of paclobutrazol to strengthen the rice plant is rated (3.27) as medium.

This implies that the overall production technology of SR production in a small area is relatively high. Farmer respondents can assess the suitability and efficiency of the SR technology on a limited scale ranging from 500 to 1,500 m^2 of production area.

Table 9. Triability of the special rice production technology.

Perceived triability of special Rice production technology	Mean rating	Description
1. Variety used		
a. CLS 2	4.39	VH
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	4.39	VH
b. Submerge the area with water for 2-3 days	4.36	VH
c. Plow the soil with water level of 2-3 cm and harrow	4.58	VH
d. Prepare plots measuring 1.5 meters width	4.61	VH
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	4.09	H
b. Drain seeds after 24 hours and incubate for 24 hours	4.58	VH
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m² seedbed area	3.91	H
b. Sow seeds with enough water level and drain it in the next morning	4.58	VH
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	4.64	VH
5. Land preparation		
a. Plow field at 10 cm depth	4.45	VH
b. Harrow field 2-3 weeks before transplanting	4.61	VH
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	4.00	H
d. Cultivate and level the soil one day before transplanting	4.85	VH
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	4.73	VH
b. Plant 2-3 seedlings per hill at distance of 20x20cm	4.58	VH
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	4.82	VH
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	4.61	VH
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	4.58	VH
b. Broadcast mix urea (3 bags) & 14-14-14 (4 bags) during wet season	3.94	H
c. Broadcast mix urea (4 bags) & 14-14-14 (6 bags) during dry season	4.33	VH
d. Organic Fertilizers	3.73	H
9. Pest and disease management		
a. Use pesticide if needed	4.30	VH
b. Use pesticide for snail 1-3 days after transplanting	4.45	VH
c. Spray paclobutrazol to strengthen rice plant	3.27	M
Perceived triability of special rice production technology	Mean rating	Description
10. Weed management and rouging		
a. Spray weed control if needed	4.36	VH
b. Rouging is done	4.18	H
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	4.70	VH
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	4.76	VH
c. Harvest using combine harvester	4.85	VH
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content and to preserve aromatic scent	4.15	H
Overall mean rating	4.27	VH

Note:

Mean range	Description
5.00 - 4.24	Very high (VH)
4.23 - 3.43	High (H)
3.42 - 2.62	Medium (M)
2.61 - 1.81	Low (L)
1.80 -1.00	Very low (VL)

Observability: Table 10 shows the perceived observability. The overall mean rating of 4.40 was obtained, indicating it is very visible. The majority of the respondents rated the 31 production technologies as very visible, 8 out of 31 were rated visible, and only 1 was rated moderately visible.

The production technology protocols rated visible are: a) Soak the seeds (40kg/ha) with fungicide for 24 hours (4.12), b) Broadcast 2 bags of organic fertilizer in a 400 m² seedbed area (3.91), c) At the last harrowing, apply organic fertilizer at 20 bags per hectare (4.03), d) Broadcast a mix of Urea (3 bags) & 14-14-14 (4 bags) during the wet season (3.94), e) Broadcast a mix of Urea (4 bags) & 14-14-14 (6 bags) during the dry season (4.21), f) Organic fertilizers (3.61),

g) Rouging is done (4.03), and h) As possible, dry harvest rice continuously for 3 hours per day to meet 14% moisture content and to preserve the aromatic scent (4.03). The application of Paclobutrazol is rated (3.18) as moderately visible. This implies that the production technology protocols for special rice are very visible in terms of quality and appearance.

Table 10. Observability of the special rice production technology.

Perceived observability of special Rice production technology	Mean rating	Description
1. Variety used		
a. CLS 2	4.48	VV
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	4.45	VV
b. Submerge the area with water for 2-3 days	4.52	VV
c. Plow the soil with water level of 2-3 cm and harrow	4.55	VV
d. Prepare plots measuring 1.5 meters width	4.64	VV
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	4.12	V
b. Drain seeds after 24 hours and incubate for 24 hours	4.58	VV
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m² seedbed area	3.91	V
b. Sow seeds with enough water level and drain it in the next morning	4.67	VV
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	4.61	VV
5. Land preparation		
a. Plow field at 10 cm depth	4.55	VV
b. Harrow field 2-3 weeks before transplanting	4.61	VV
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	4.03	V
d. Cultivate and level the soil one day before transplanting	4.85	VV
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	4.70	VV
b. Plant 2-3 seedlings per hill at distance of 20x20cm	4.73	VV
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	4.79	VV
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	4.67	VV
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	4.58	VV
b. Broadcast mix Urea (3 bags) & 14-14-14 (4 bags) during wet season	3.94	V
c. Broadcast mix Urea (4 bags) & 14-14-14 (6 bags) during dry season	4.21	V
d. Organic Fertilizers	3.61	V
9. Pest and disease management		
a. Use pesticide if needed	4.39	VV
b. Use pesticide for snail 1-3 days after transplanting	4.42	VV
Perceived observability of special rice production technology	Mean rating	Description
c. Spray paclobutrazol to strengthen rice plant	3.18	MV
10. Weed management and rouging		
a. Spray weed control if needed	4.30	VV
b. Rouging is done	4.03	V
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	4.64	VV
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	4.79	VV
c. Harvest using combine harvester	4.85	VV
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content and to preserve aromatic scent	4.03	V
Overall mean rating	4.40	VV

Note:	Mean range	Description
	5.00 - 4.24	Very visible (vv)
	4.23 - 3.43	Visible (V)
	3.42 - 2.62	Moderately visible (MV)
	2.61 - 1.81	Less visible (LV)
	1.80 -1.00	Not visible (NV)

Summary table on the perceived technology attributes.

In summary, farmer-respondents' perception of the technology was highly positive (Table 11). The relative advantage, with a mean rating of 4.43, revealed a very relevant attribute compared to other variables. Special rice commands a relatively higher price than the other ordinary rice varieties due to its unique characteristics along with its other health benefits.

In terms of compatibility, the rating was 4.42, described as very compatible. The planting of special rice is not different from current production practices of inbred rice in terms of labor, fertilizer application, and other cultural pest management practices.

Complexity was noted as 4.44, described as very easy to use. This is supported by the increased number of adopters planting SR over two years, although there was a decline in 2023.

Triability was noted at 4.27, indicating that SR can be planted on a small scale. The mean farm size devoted to SR by the farmer-respondents was 0.5 ha, which is almost one-fourth of the total farm area cultivated by the farmers.

Observability was noted at 4.40, which means that the goodness of the SR in terms of production or the standard of the crop can be observed. Grain quality, in terms of color, eating quality, and the effect on a low glycemic index, was highly observable. Lastly, the demand for the SR was relatively increasing due to its perceived health benefits.

Table 11. Summary table on the perception of farmer-respondents on the special rice production technology attributes.

Perceived attributes of special rice production technology	Mean	Description
Relative advantage	4.43	VR
Compatibility	4.42	VC
Complexity	4.44	VE
Triability	4.27	VH
Observability	4.40	VV
Overall mean rating	4.39	VH

4.5. Level of Adoption

For this study, the level of adoption is measured in terms of the number of technologies adopted by the farmer respondents. Table 12 presents the number of farmers who adopted the special rice production technology protocol.

As shown in Table 12, the overall mean of 27.81 indicates a very high level of adoption. The results imply that the production technology can be strongly promoted as an alternative rice variety and a promising agribusiness in the rice industry.

The specific production protocols that were not fully adopted are as follows: a) broadcast of 2 bags of organic fertilizer in a 400m² seedbed area (21); b) at the last harrowing, apply organic fertilizer at 20 bags per hectare (21); c) application of organic fertilizers (21); d) spray of paclobutrazol to strengthen the rice plant (18). The relatively low application of organic fertilizer was due to the high cost of organic fertilizer per hectare (20 bags/hectare) and the issues of the lack of quality available organic fertilizers. Studies have shown that organic fertilizers are beneficial for soil fertility and crop yield but are not widely used due to economic and quality constraints that affect efficacy and reliability in improving soil health and crop productivity (Singh et al., 2020).

Table 12. Level of adoption.

Special rice production technology	No. of farmer who adopted the technology	Level of adoption
1. Variety used		
a. CLS 2	33	VH
2. Seedbed preparation		
a. Prepare 400 m² seedbed area at 21-25 days before transplanting	31	VH
b. Submerge the area with water for 2-3 days	32	VH
c. Plow the soil with water level of 2-3 cm and harrow	31	VH
d. Prepare plots measuring 1.5 meters width	32	VH
3. Seed germination		
a. Soak the seeds (40kg/ha) with fungicide for 24 hours	30	VH
b. Drain seeds after 24 hours and incubate for 24 hours	30	VH
4. Seedling production		
a. Broadcast 2 bags of organic fertilizer in 400 m² seedbed area	21	H
b. Sow seeds with enough water level and drain it in the next morning	32	VH
c. Maintain 2-3 cm depth of water level for 21-25 days before pull out the seedling for transplant	31	VH
5. Land preparation		
a. Plow field at 10 cm depth	32	VH
b. Harrow field 2-3 weeks before transplanting	31	VH
c. At last harrowing, apply organic fertilizer at 20 bags per hectare	21	H
d. Cultivate and level the soil one day before transplanting	31	VH
6. Transplanting		
a. Transplant seedlings after 25-30 days from sowing	30	VH
b. Plant 2-3 seedlings per hill at distance of 20x20cm	31	VH

Special rice production technology	No. of farmer who adopted the technology	Level of adoption
7. Water management		
a. Maintain 2-3 cm water level for 25-30 days after transplant	33	VH
b. Increase water level at 5 cm as rice grow & drain water one (1) week before harvest	30	VH
8. Nutrient management / Use of fertilizers		
a. Apply fertilizer in right time and dosage	33	VH
b. Broadcast mix urea (3 bags) & 14-14-14 (4 bags) during wet season	28	VH
c. Broadcast mix urea (4 bags) & 14-14-14 (6 bags) during dry season	31	VH
d. Organic fertilizers	21	H
9. Pest and disease management		
a. Use pesticide if needed	33	VH
b. Use pesticide for snail 1-3 days after transplanting	30	VH
c. Spray paclobutrazol to strengthen rice plant	18	M
10. Weed management and rouging		
a. Spray weed control if needed	32	VH
b. Rouging is done	25	H
11. Harvesting and postharvest management		
a. Drain water one week before harvesting	32	VH
b. Harvest when 80% of the grains are ripe with moisture content of 20-22%	32	VH
c. Harvest using combine harvester	31	VH
d. As possible, dry harvest rice continuously 3 hours per day to meet 14% moisture content and to preserve aromatic scent	30	VH
Overall	27.81	VH

Note:

No. of farmer who adopted the technology	Description
27 - 33	Very high (VH)
20 – 27	High (H)
14 – 20	Moderate (M)
7 – 14	Low (L)
1 – 7	Very low (VL)

4.6. Respondents' Adoption Characteristics

Table 13 provides an overview of the respondents' adoption characteristics regarding Special Rice Production Technology, including the timeline, sources of information, learning methods, adoption patterns, and future intentions.

The majority of the 19 respondents (57.6%) learned about SPR in 2022. Other significant years included 2020, with 7 respondents (21.2%), 2021 with 3 respondents (9.1%), and both 2017 and 2023, with 2 respondents each (6.1%).

The majority of 32 respondents (97%) learned recommended practices from CLSU, with only 1 respondent (3%) obtaining this information from an organization or association. This signifies a significant positive intervention by CLSU in disseminating information about new farming practices among farmer-respondents regarding the new innovation in special rice production technology.

Extension workers were the primary source of information for 24 respondents (72.7%), followed by technical experts for 8 respondents (24.2%), and farmers for 1 respondent (3%).

Training was the primary method through which 20 respondents (60.6%) learned about SRP, while 13 respondents (39.4%) utilized Information, Education, and Communication (IEC) materials.

The majority of respondents first used SRP in 2022, with 15 individuals (45.5%) adopting it that year. Other notable years included 2021 with 9 respondents (27.3%), 2023 with 6 respondents (18.2%), 2020 with 2 respondents (6.1%), and 2017 with 1 respondent (3%).

Adoption occurred almost equally in both seasons, with 17 respondents (51.5%) adopting in the dry season and 16 respondents (48.5%) in the wet season.

Most respondents (19 or 57.57%) dedicated 3,750 square meters or less to SRP. Other production area sizes included 3,751-7,000 square meters for 10 respondents (30.30%), and over 16,751-20,000 square meters for 2 respondents (6.06%).

A significant majority of respondents, 31 (93.9%), expressed a desire to continue adopting SRP, with only 2 respondents (6.1%) indicating that they will not.

The adoption characteristics of Special Rice Production among respondents showed a high level of engagement and continued interest, primarily driven by the higher profitability and ease of adopting SRP practices. Most respondents learned about SRP from CLSU and extension workers, with training being the predominant method of learning. Adoption has been widespread since 2022, with nearly equal uptake in both wet and dry seasons. The commitment to continued adoption was strong, with 93.9% of respondents planning to persist with SRP, motivated by the economic benefits and practical advantages it offers. There was also a notable demand for further technical information, particularly regarding processing and organic practices, indicating areas for future extension services to address.

Table 13. Respondents' adoption characteristics.

Variable	Frequency*	Percentage
When did you learn SPR?		
2017	2	6.1
2020	7	21.2
2021	3	9.1
2022	19	57.6
2023	2	6.1
Where did you learn SPR recommended production technology?		
CLSU	32	97.0
Organization/ Association	1	3.0
From Whom?		
Extension workers	24	72.7
Technical experts	8	24.2
Co-farmers	1	3.0
How did you learn SPR?		
SPR training from CLSU	20	60.6
Variable	Frequency*	Percentage
CLSU IEC materials	13	39.4
When did you first use the SPR (Year)?		
2017	1	3.0
2020	2	6.1
2021	9	27.3
2022	15	45.5
2023	6	18.2
What season?		
Wet	16	48.5
Dry	17	51.5
Production area for SPR (m2)		
3,750 and below	19	57.57
3,751-7,000	10	30.30
7,001-10,250	1	3.03
10,251-13,500	0	0
13,501-16,750	1	3.030
16,751-20,000	2	6.06
Will you continue adopting?		
Yes	31	93.9
No	2	6.1

Note: *Multiple answers.

4.7. Reasons for Adoption of Special Rice Production Technology

Table 14 presents the reasons behind the adoption of Special Rice Production Technology as reported by respondents, highlighting various motivating factors driving adoption.

A significant majority of respondents, 18 (54.5%), cited the desire for additional income or the prospect of obtaining a higher price as the primary reason for adopting Special Rice Production Technology. This emphasizes the economic incentive and potential profitability associated with this agricultural practice.

A small portion of respondents, 2 (6.1%), mentioned home consumption as a reason for adoption, indicating a preference for cultivating special rice for personal or household consumption needs.

Eight respondents (24.2%) reported having a sure buyer as a reason for adoption, indicating the presence of reliable market channels or established relationships with buyers, which can provide stability and assurance to farmers.

Four respondents (12.1%) cited gaining additional knowledge as a reason for adopting Special Rice Production Technology, indicating an interest in acquiring new skills and expertise in agricultural practices.

Five respondents (15.2%) mentioned health benefits as a motivating factor for adoption, suggesting an awareness of the nutritional advantages or perceived health benefits associated with the consumption of special rice.

A portion of 6 respondents (18.2%) mentioned the ease of care associated with special rice production as a reason for adoption, signifying that the cultivation process may require less intensive labor or resources compared to other crops.

Five respondents (15.2%) highlighted the low cost of production as a reason for adoption, indicating that special rice production may offer cost-effective agricultural practices that contribute to profitability.

One respondent (3%) mentioned the higher quality of special rice as a reason for adoption, suggesting that the unique characteristics or superior attributes of special rice compared to traditional varieties may drive adoption.

The reasons for adopting Special Rice Production Technology among respondents are multifaceted, reflecting both economic incentives and intrinsic motivations. The primary drivers include the potential for additional income and higher prices, followed by factors such as home consumption, the presence of a sure buyer, and the desire to acquire additional knowledge. Additionally, considerations such as health benefits, ease of care, low production costs, and perceived higher quality contribute to the appeal of special rice production. Understanding these motivating factors is crucial for policymakers, agricultural extension services, and stakeholders to support and promote the adoption of special rice production technology among farmers.

Table 14. Reasons for adoption of special rice production technology.

Variable	Frequency*	Percentage
Additional income/Higher price	18	54.5
Home consumption	2	6.1
Sure buyer	8	24.2
Additional knowledge	4	12.1
Health benefits	5	15.2
Easy to care	6	18.2
Low cost of production	5	15.2
Higher quality	1	3.0

Note: *Multiple response.

4.8. Correlation Analysis

The correlation analysis reveals an understanding of the relationships between various independent variables, individual factors, institutional factors, and technology factors in relation to the outcomes regarding the level of adoption in terms of the number of farmers who adopted the technology (Table 15).

Individual Factors: Age has a weak positive correlation (0.164) with the level of adoption, indicating that older individuals tend to adopt slightly more, although the effect is minor. Educational attainment shows a moderate negative correlation (-0.308) with the level of adoption, which indicates that higher education levels are associated with lower adoption rates. This could imply that more educated individuals either find the practice less appealing or prefer alternative solutions.

Household size also exhibited a weak negative correlation (-0.185), meaning larger households tend to have slightly lower adoption levels, possibly due to resource constraints or differing priorities.

Farming experience positively affects adoption (0.276), implying that more experienced farmers are more likely to adopt due to greater familiarity and comfort with new practices. Farm size, however, has a minimal positive impact on adoption (0.022), showing that the size of the farm is not a significant factor in adoption decisions.

Tenurial status had a very weak negative correlation effect on the level of adoption (-0.017), which shows no effect on their likelihood of adopting new technology/practices. Access to water through the National Irrigation Administration (NIA) had a significantly strong positive correlation (0.418*) with adoption, indicating that reliable water sources greatly enhance adoption levels.

The positive correlation between age and adoption suggests that older farmers may be more open to adopting new technologies, possibly due to greater experience and resources. However, the negative correlation with educational attainment indicates that formal education may not directly translate to better adoption of agricultural technologies.

Institutional Factors: Training services had a moderate positive impact on adoption (0.194), which shows that individuals who participate in training sessions tend to have a slightly higher adoption rate, which implies that exposure to training has a positive effect on their willingness and ability to adopt new technologies or practices.

The correlation analysis on perceived information services to the level of adoption revealed varying degrees of influence from different sources and modes of information. Information sourced from the Central Luzon State University (CLSU) had a strong positive correlation (0.448**) with the level of adoption. This significant positive relationship suggests that information from CLSU is highly effective in encouraging adoption, possibly due to the credibility and relevance of the information provided by this institution.

However, information from extension workers showed a moderate negative correlation (-0.210) with the level of adoption. This indicates that reliance on extension workers for information is associated with lower adoption rates. This negative correlation might reflect issues such as the quality or perceived relevance of the information provided by extension workers, or possibly a mistrust or lack of confidence in these sources. Farmers had a weak positive correlation on adoption (0.047). This implies that farmers' network of information has an influence on their adoption decisions, possibly because of their trust in co-farmers, which has proven effective and relevant.

Technical advisory services had a negative impact on the level of adoption (-0.060). This may suggest that the knowledge and information provided by extension services are more focused on training and general information, with limited emphasis on technical consultancy regarding the Special Rice Production (SRP) protocol. It could also imply that the SRP protocol is quite similar to that of inbred rice varieties, reducing the need for frequent consultancy and advisory services from technical experts.

The significant positive impact of CLSU on adoption underlines the importance of accessible and high-quality training and information services.

Technology Factors: Relative advantage showed strong positive correlations with adoption (.502**). This indicates that when individuals perceive a significant benefit or improvement from adopting the technology compared to existing methods, they are more likely to adopt it. The higher the perceived relative advantage, the greater the likelihood of adoption.

Compatibility had similar strong positive correlations with adoption (.543**). This indicates that technologies perceived to be compatible with existing values, past experiences, and current needs of the users are more likely to be adopted. When individuals find that a new technology fits well within their current practices and lifestyle, they are more inclined to adopt it. Complexity had significant positive correlations with adoption (.686**). This shows that the special rice production technology protocol is very easy to use and understand due to the similarity of production practices with other varieties of rice they are planted.

Triability also shows strong positive correlations with adoption (0.675**). This suggests that when individuals can experiment with a technology on a limited basis before fully committing, they are more likely to adopt it. The ability to trial a technology reduces perceived risk and uncertainty, thus facilitating higher adoption rates.

Observability is positively correlated with adoption (0.623). This shows that when the results and benefits of a technology are visible and observable to others, it increases the likelihood of adoption. Seeing the positive outcomes of a technology in real-world scenarios encourages others to adopt it as well.

The strong positive correlations of relative advantage, compatibility, complexity, trialability, and observability with adoption emphasize the importance of these attributes in technology diffusion among farmers.

In summary, the correlation revealed that individual factors such as age and farming experience, along with institutional support and favorable technology characteristics, significantly influenced the adoption of agricultural technologies.

Table 15. Correlation of independent variables to the level of adoption.

Variables	Level of adoption (Percentage)
Individual factors	
Age	0.164
Educational attainment (Years)	-0.308
Household size	-0.185
Farming experience	0.276
Farm size	0.022
Tenurial status	-0.017
Family income	-0.106
Water source	0.418*
Institutional factors	
Training services	0.194
Information services	
Clsu	0.448**
Extension workers	-0.210
Farmers	0.047
Technical advisory services	-0.060
Technology factors	
Relative advantage	0.502**
Compatibility	0.543**
Complexity	0.686**
Triability	0.675**
Observability	0.623**

Note: * statistical significance at the 0.05 level.
** statistical significance at the 0.01 level.

4.9. Regression Analysis

Table 16 shows that the socio-economic factors that positively affect the level of adoption are gross income and source of water, while farm size negatively affects the level of adoption. This means that a higher gross income for farmers is associated with a significant increase in the level of adoption by 7.04%. Farmers with higher incomes are more likely to adopt new technologies due to better access to financial resources (Feder et al., 1985).

Additionally, the source of water significantly affects the level of adoption positively by 6.82%, which means that a readily available source of water will increase the adoption level of SPR technology. Access to water is a significant factor in adopting new practices that improve land productivity and reduce degradation (Shiferaw & Holden, 1998).

However, an increase in farm size has a significant negative effect on the level of adoption, decreasing by 0.000069%, which is a very minimal effect. The result is slightly opposite to the expectation that larger farmers are more likely to adopt agricultural technologies than farmers with small land holdings.(Kasirye, 2013).

The institutional factor that negatively affects the level of adoption is the training services related to the production of special purpose rice, which is at -4.92%. This result is contrary to the study of factors affecting the adoption of organic rice farming, where farmers' participation in training has been found to have a positive influence on the respondents' adoption (Chanhathai, Suneeporn, & Panya, 2016).

Relative advantage as a technological factor significantly affects the level of adoption negatively by -0.53%. These factors may be influenced by economic profitability, social prestige, physical convenience, low initial cost, lower perceived risk, decreased discomfort, psychological satisfaction, or time savings (Rogers, 2003). The results of this study on perceived attributes of the relative advantage of the special rice technology protocol among the 33 respondents indicate that they are less likely to adopt the application of fungicide during seed germination, the use of organic fertilizer, and the application of paclobutrazol, which may be considered additional costs and time.

Table 16. Regression analysis.

Variables	Coefficients	t stat	P-value
Farm size	-0.000	-2.302	0.035
Gross income	7.046	2.318	0.034
Source of water	6.824	2.879	0.010
Training services	-4.924	-2.324	0.033
Relative advantage	-0.530	-2.254	0.038

Note: Adjusted R^2 - 0.6804
F Value - 5.2594

5. CONCLUSION

The majority of farmer respondents participated in training sessions primarily provided by CLSU, focused on the Agro Enterprise Clustering Approach. This training provided a strategic framework to enhance agricultural productivity and sustainability by grouping together related agricultural enterprises within the community of rice farmers. However, the results show that it has a negative effect on the adoption of the special rice technology protocol among the respondents, despite the awareness they acquired.

The farmers with higher gross income and access to a reliable water source have positively influenced the level of adoption of SPR technology. Conversely, larger farm sizes have a minimal negative effect on adoption. This suggests that farmers with better financial resources and water availability are more likely to adopt new technologies. Additionally, the study finds that the perceived adequacy of extension services positively impacts adoption; however, a surprising negative effect of training services on adoption is noted, which contrasts with typical findings where training is expected to enhance the adoption level.

Despite the overall positive perception of technology attributes, the relative advantage shows a negative effect on adoption. This may indicate that the perceived additional costs or difficulties associated with certain technology protocols are preventing adoption.

Furthermore, the overall adoption level of special rice production technology is very high, with a mean rating of 27.81. Adoption has been widespread since 2022, and farmers are generally committed to continuing its use, motivated by economic benefits, profitability, and ease of adoption. However, some protocols, particularly those involving the application of organic fertilizers, fungicides, and paclobutrazol, are less frequently adopted due to economic and practical concerns.

The extension services from CLSU play a significant role in facilitating the adoption of SPR technology. However, challenges related to the costs and complexities of the technology, as well as unexpected negative effects on training, highlight areas for improvement. Future efforts should focus on addressing these challenges, ensuring that economic and practical barriers do not hinder the widespread adoption and successful implementation of special-purpose rice production technology.

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