Scientific Journal Warsaw University of Life Sciences – SGGW
Problems of World Agriculture volume 25(XL), number 3, 2025: 13-30
DOI: 10.22630/PRS.2025.25.3.9

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Understanding the Knowledge, Practices, and Production Levels of Rice Farmers in Samar, Philippines

Abstract. This paper aims to evaluate the knowledge, practices, and production levels of rice farmers and identify their significant factors using statistical models. The study involved 84 rice farmers in Barangay Barobaybay, Calbiga, Samar, Philippines, with the aid of complete enumeration sampling. Primary and cross-sectional data were gathered using the researchers' developed questionnaire based on the current literature. Using a quantitative research design, the data were analysed using descriptive statistical measures, correlation analysis, and ordinal regression modelling. Results suggested that, on average, rice farmers' perceived level of knowledge (M=4.37; SD=0.39), practices (M=4.32; SD=0.41), and production (M=4.29; SD=0.39) in farming are considered very high. This implies that rice farmers display strong knowledge, effective farming practices, and efficient production processes. The correlation analysis revealed that farmers' knowledge, practices, and production levels are highly correlated with each other. This indicates that farmers' knowledge is vital to their farming practices by adopting technologies that positively influence their productivity. Moreover, the ordinal regression revealed that tenure status (being a tenant farmer) is a significant (at a 10% level) predictor of farmers' knowledge, practices, and production activities. Notably, to support rice farmers who lease land, the government should promote policies that provide more secure land tenure, encouraging long-term investment in farming. Moreover, the study suggests that future interventions and support programs should promote innovative and advanced techniques to ensure the continued growth and success of rice farming in the region.

Keywords: rice farming, knowledge and practices, rice production level, regression models, Philippines

JEL Classification: Q12, Q13, Q16

Introduction

In the Philippines, millions of Filipinos live in rural areas, and agriculture is one of their main sources of livelihood and income to sustain economic activities. In fact, rice farming is an important asset in the Philippines, wherein the economy and food supply of many impoverished Filipino households are realised (Bollido, 2019; Casinillo & Seriño, 2022). In the study by Casinillo (2020), it is portrayed that rice farming provides employment, food security, and national income in the country. However, rural areas in the Philippines primarily rely on elderly farmers with limited education on farming activities and are still using

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traditional techniques (Red et al., 2021). Additionally, the knowledge, practices, and agricultural production levels in the Philippines are relatively low compared to other progressive countries (Cuaton & Delina, 2022). According to the literature, production levels in rice farming in the Philippines refer to the quantity of output and farming activities, which are influenced by several factors that include farm size, management, access to resources, labour, capital, and the adoption of innovative technologies (Casinillo, 2023; Dait, 2023). Therefore, the production level in rice farming is dependent on the knowledge, practices, and resources of the farmers, which need to be enhanced (Ntawuruhunga et al., 2020). Hence, these farmers require assistance from the government and other agencies concerning the support of modern farming knowledge and practices, up-to-date advancements and innovative technologies, agricultural inputs, financial support, and essential resources for the rice production process, among others, to increase the agricultural production level (Okwuokenye & Okoedo-Okojie, 2014; Jones, 2024). In particular, Samar, Philippines has significant agricultural activity, with the region's topography and climate being conducive to rice production activities. In the area of Samar, farmers normally practice wet rice cultivation, taking advantage of the region's abundant rainfall and water irrigation. They commonly use traditional methods combined with modern planting, irrigation, and harvesting techniques (Bollido, 2019).

The town of Calbiga, located in the province of Samar, contributes significantly to the region's rice production. The area is known for its lush rice paddies and favourable climate for agriculture, in which farming activities and practices are notably active (Robedizo, 2015). Farmers engage in both rain-fed and irrigated rice farming methods. They typically grow rice varieties such as the popular IR (International Rice) varieties or hybrid strains, using traditional planting techniques and modern farming practices. The community's livelihood is deeply rooted in agriculture, with rice farming being a primary occupation, contributing significantly to the local income and economy (Bollido, 2019). However, these rural farmers are still using traditional techniques in farming, which are not suitable for the current climate and situation. Accordingly, it is vital to investigate farmers' knowledge, practices, and production to gather information on how to improve their agricultural activities, as well as their economic profitability (Red et al., 2021). While there are numerous studies that examine the knowledge and practices of farmers, there is a lack of local literature exploring this matter, despite Calbiga, Samar, Philippines, being one of the significant contributors to rice production in the province. Additionally, most studies on rice farming knowledge, practices, and production that have been undertaken do not employ statistical models to capture significant predictors (Zossou et al., 2020; Omar et al., 2022; Sarma et al., 2022). Although there are a few international research papers that account for the relationship of the same variables, there is no guarantee that the result obtained from the study could be the same as that of the local community of Calbiga, Samar. Therefore, this research paper was conducted to address this gap.

Generally, our main objective in this study is to determine rice farmers' knowledge, practices, and production levels in the lowland areas in Samar, Philippines. Specifically, the paper sought to answer the following: (1) to assess their socio-demographic and economic profile; (2) to evaluate the level of rice farmers' knowledge in farming, examine the farming practices they employ, and find out their perceived level of rice production; and (3) to develop a statistical model that captures the predictors of farmers' knowledge, practices, and production. The study of rice farming knowledge, practices, and production levels of lowland farmers in Samar, Philippines, can provide numerous benefits, such as learning new strategies

and enhancing existing methods, and farmers may boost their output and earnings, as well as improve their living standards. In addition, the results of the study may provide details on how to enhance food security that will benefit the entire community and improve rice farming efficiency, increase food production, reduce import dependence, and bolster local market stability. Moreover, agencies like the Department of Agriculture (DA) and Local Government Units (LGU) may derive significant value from this study, and the insights gained can underpin policies and initiatives that foster regional agricultural growth. Furthermore, researchers specialising in agriculture and rural development can utilise the data gathered from the study to conduct further research, create models, and contribute to the field's knowledge base.

Methods

The Research Design

The aim of this study is to describe the level of knowledge, practices, and production of rice farmers and to determine the significant factors affecting it. Accordingly, this research paper employed quantitative research called a descriptive-correlational design, which calculates some standard descriptive measures and uses a statistical inference, particularly, regression analysis. The purpose of the said research design is to provide an explanation and a detailed snapshot of the situation regarding the rice farmers' knowledge, practices, and production levels, as well as to examine their relationship to socioeconomic profiles.

The Respondents, Sampling, and Ethics

Barobaybay is a barangay in the municipality of Calbiga, in the province of Samar, Philippines. The Barobaybay Farmers Association is an association of 84 farmers in the isolated town of Barangay Barobaybay; they have a total farmland of 104.87 hectares, according to the recent official data (as of 2013) from the local administration office of Barangay Barobaybay. This barangay currently ranks among the province's top rice producers; hence, this study focused on the Barangay Barobaybay, Calbiga, Samar, to learn lowland farmers' rice farming knowledge, practices, and knowledge. As Barangay Barobaybay has a small population, the researchers decided to include all 84 farmers as participants. The decision to include all 84 rice farmers in Barangay Barobaybay was based on the unique characteristics of the population, precisely its relatively small size. Complete enumeration ensures that every individual within the population is represented in the study, eliminating sampling variability and allowing for a comprehensive understanding of rice farming knowledge, practices, and production among all members. This approach is particularly beneficial when dealing with a homogenous and manageable population, as is the case in Barangay Barobaybay, where the aim is to capture the entirety of the rice farming community and provide a thorough analysis of the factors influencing their agricultural activities. To secure prior consent from the community, the researchers wrote a formal communication letter to the barangay chief of the selected site. Upon provision of consent, the researchers immediately administered the questionnaire to the target respondents. Rice farmers involved in the survey were informed that their participation in the research is voluntary, and the data gathered from them is confidential and will be used solely for this current study.

The Research Instrument and Data Collection

This study employed a developed structured questionnaire based on the current studies in the literature (Robedizo, 2015; Red et al., 2021; Casinillo et al., 2023). The research instrument has four (4) sections, such as (i) profile of rice farmers, (ii) knowledge of rice farming, (iii) practices of technologies, and (iv) production level. The actual gathering of data is a face-to-face interview in which the dialect of rice farmers was considered so that they could comprehend and answer accordingly. As for the profile, rice farmers were asked about the following: (a) age (actual number of years), (b) sex (male or female), (c) educational attainment, (d) years in farming, (e) tenurial status. The second section is the knowledge of farmers in rice farming, wherein they were asked 14 questions (5-point rating scale). The third section is the practices of farmers in adopting agricultural techniques, which consists of 10 structured questions (5-point rating scale). The last section is the production level of farmers, which consists of 13 structured questions (5-point rating scale). Table 1 shows the range of farmers' perceived knowledge, practices, and production scores, and their responses and interpretations.

Table 1. Farmers' perceived knowledge, practices, and production scores, and their corresponding responses and interpretations

Scale	Range	Response	Level of Knowledge	Level of Practices	Level of Production
5	4.20-5.00	Strongly Agree	Very High Knowledge	Very High Practices	Very High Production
4	3.40-4.19	Agree	High Knowledge	High Practices	High Production
3	2.60-3.39	Neutral	Moderate Knowledge	Moderate Practices	Moderate Production
2	1.80-2.59	Disagree	Low Knowledge	Low Practices	Low Production
1	1.00-1.79	Strongly Disagree	Very Low Knowledge	Very Low Practices	Very Low Production

Source: Authors' guide (2025).

Some experts (at least master's degree holders) have evaluated the research instrument for validity testing and found that it is valid in that it is a good questionnaire that captures farmers' experiences and well-being. To ensure our research instrument was well-grounded, the researchers conducted a pilot test with people similar to our primary respondents to check if the questionnaire was reliable. The researchers used Cronbach's Alpha (Cronbach, 1951) to analyse the results. Our data had an alpha (reliability coefficient) of 0.77-0.85, indicating the reliability was good (Table 2).

Table 2. Reliability test for the questionnaire

Questionnaire	No. of items	Reliability
Knowledge	14	0.85
Practices	10	0.77
Production	13	0.82

Source: Authors' calculation, 2025.

Data Management and Empirical Models

In describing the gathered data, appropriate statistical measures were computed, such as percentages (%), mean (M), and standard deviation (SD). Additionally, bar graphs were constructed to easily understand and compare the variables. Moreover, the Spearman rho correlation was employed to explain the relationship between knowledge, practices, and production levels of rice farmers. Table 3 depicts the intervals of the Spearman correlation coefficient in which they might fall and their linguistic interpretation (Casinillo & Guarte, 2018).

Table 3. Intervals of the Spearman correlation coefficients and their linguistic interpretation

Spearman Correlation Coefficient (r_s)	**Linguistic interpretation**
$0.0 \leq \|r\| \leq 0.3$	Weak association
$0.3 < \|r\| \leq 0.7$	Moderate association
$0.7 < \|r\| \leq 1.0$	Strong association

Source: Casinillo and Guarte, 2018.

In determining the possible factors affecting the knowledge, practices, and production level of rice farmers, ordered logit regression modelling was constructed. Necessary diagnostic tests were performed to ensure sound statistical results. All computations are aided with Microsoft Excel and STATA version 14.0 software, and tested for a standard level of significance. Hence, the empirical and statistical models are as follows:

$$Knowledge_i = a_0 + a_1 Age_i + a_2 Male_i + a_3 College_i + a_4 YFarming_i + a_5 Owner_i + e_j \quad (1)$$

$$Practices_i = b_0 + b_1 Age_i + b_2 Male_i + b_3 College_i + b_4 YFarming_i + b_5 Owner_i + u_j \quad (2)$$

$$Production_i = c_0 + c_1 Age_i + c_2 Male_i + c_3 College_i + c_4 YFarming_i + c_5 Owner_i + \varepsilon_j \quad (3)$$

where $Knowledge_i$, $Practices_i$, and $Production_i$ are dependent variables in the regression model that refer to farmers' perceived level of knowledge, practices, and production in rice farming, respectively, where $i \in \{1, 2, \ldots, 84\}$, which refers to the ith rice farmer. In addition, $a_i, b_i, and\ c_i$ are the coefficients of the regression models ((1), (2), and (3), respectively) that are to be estimated and subject to interpretation. Moreover, Age_i refers to the actual age in years of rice farmers, $Male_i$ refers to an indicator (dummy) variable that captures a male farmer (0-female, 1-male), $College_i$ refers to an indicator (dummy) variable that captures a rice farmer with college-level education (0-not college level, 1-college level), $YFarming_i$ refers to an indicator (dummy) variable that captures a rice farmer who has 16 or more years in farming (0-below 16 years, 1-16 or more years), $Owner_i$ refers to an indicator (dummy) variable that captures a rice farmer who has owned their rice paddy farm (0-not an owner, 1-owner), and e_j , u_j and ε_j refers to the remaining errors in the models (1), (2), and (3), respectively.

Results and Discussion

Profile of Rice Farmers

Table 4 depicts the profile of rice farmers in Barangay Barobaybay, Calbiga, Samar, Philippines. On average, the age of the rice farmers is close to 55.07 (SD=13.83). This implies that most of the farmers are of mature working age, and this result is consistent with the findings in the study by Casinillo & Seriño (2022), which indicates that rice farmers are mostly older farmers. Table 4 presents that the majority, or 47.61%, belonged to the prime working ages (25 to 54 years old), about 23.80% of the rice farmers are of mature working age (55 to 64 years old), and 28.57% are elderly (65 years old or more). As younger generations pursue alternative career paths or move to urban areas looking for decent work, there is a risk of a labour shortage in the near future and a decline in agricultural knowledge transfer.

Table 4. Rice farmers' profile

Profile	Frequency	Percentage (%)
Age		
25-54 years old	40	47.61
55-64 years old	20	23.80
65+ years old	24	28.57
Total	**84**	**100.00**
Sex		
Male	62	73.80
Female	22	26.19
Total	**84**	**100.00**
Years in Farming		
Less than 1 year	2	2.38
1 to 5 years	8	9.52
6 to 10 years	11	13.09
11 to 15 years	0	0.00
16 years or more	63	75.00
Total	**84**	**100.00**
Educational Attainment		
No formal education	2	2.38
Elementary	43	51.19
High school	29	34.52
College	10	11.90
Total	**84**	**100.00**
Tenurial Status		
Own	19	22.61
Lease	61	72.61
Own and Lease	4	4.76
Total	**84**	**100.00**

Source: Authors' calculation, 2025.

Table 4 shows that among all respondents, 73.80% were male, and 26.19% were female. Based on the result, it is evident that farming is primarily undertaken by men. The basis for this is that men usually perform most rice farming activities, which are heavy or masculine types of work (Saugeres, 2002; Casinillo, 2022). There were 2.38% of the farmers who had farming experience of less than a year, 9.52% of them had 1 to 5 years, 13.09% of them had 10 years, and 75.00% had 16 years or more (Table 4). A rice farmer with more experience tends to achieve better production outcomes and profitability, which means that an experienced farmer often has more effective farming techniques, improved decision-making skills, and a profound understanding of farming practices (Mandal & Singh, 2020). Table 4 depicts that there are 2.38% with no formal education, 51.19% with elementary education, 34.52% with high school education, 21.1% are high school graduates, 24.0% are college undergraduates, and 11.90% have college education. Limited education can hinder farmers in their ability to improve productivity, adapt to new challenges, and enhance their overall living conditions. Hence, in the study by Nakano et al. (2018), it is necessary that farmers have training in new technologies to improve their production levels, as well as their economic profitability. Among rice farmers, 72.61% have leased farmland, 22.61% own their farmland, and 4.76% of them have both owned and leased land (Table 4). In the study by Kumari and Nakano (2016), it is stated that it is better for a farmer to own their land since they do not have to pay rent, which affects the production financial budget, and they also discovered that tenant-status farmers have lower production activities due to higher costs.

Knowledge, Practices, and Production

Table 5 shows that rice farmers strongly agree with all the knowledge questions, which indicates that they are knowledgeable in farming activities. On average, farmers' perceived knowledge scores are close to 4.37 (SD=0.39), which can be interpreted as having a "very high knowledge" of farming skills. Figure 1 shows that no farmers have very low or low knowledge of rice farming. This implies that at least they have already gained some agricultural techniques from their experiences. Only 1.19% of the rice farmers have a moderate knowledge of farming, 32.14% of them have high knowledge, and 66.67% of them have very high knowledge. This implies that rice farmers in Barangay Barobaybay, Calbiga, Samar, are knowledgeable and equipped about the farming system and production activities. In the paper by Zossou et al. (2020), it is portrayed that farmers with a good understanding and adequate knowledge of modern rice production activities have a greater possibility of achieving high crop yields.

Table 5. Level of knowledge of rice farmers

Statement	Mean	SD	Description	Interpretation*
1. I am well-versed in the importance of soil health for successful rice production.	4.55	0.57	Strongly Agree	Very High Knowledge
2. I actively seek out and stay informed about the latest advancements in rice cultivation.	4.44	0.61	Strongly Agree	Very High Knowledge
3. Pest and disease management in rice fields is an area where I feel confident in my knowledge.	4.29	0.74	Strongly Agree	Very High Knowledge
4. I regularly participate in training programs to enhance my rice farming knowledge.	4.37	0.72	Strongly Agree	Very High Knowledge
5. I am familiar with and utilise the latest technologies in modern rice farming.	4.40	0.60	Strongly Agree	Very High Knowledge
6. Following recommended guidelines for water management in rice paddies is second nature to me.	4.29	0.77	Strongly Agree	Very High Knowledge
7. I am aware of the impacts of climate change on rice farming and adjust my practices accordingly.	4.26	0.73	Strongly Agree	Very High Knowledge
8. I can easily identify different rice varieties and understand their suitable growing conditions.	4.31	0.69	Strongly Agree	Very High Knowledge
9. Sustainable farming practices that enhance rice production are well within my knowledge base.	4.48	0.63	Strongly Agree	Very High Knowledge
10. I keep myself updated on government policies and support available for rice farmers.	4.30	0.60	Strongly Agree	Very High Knowledge
11. Crop rotation's importance in rice farming is a concept I thoroughly understand.	4.29	0.63	Strongly Agree	Very High Knowledge
12. I am aware of the benefits of crop diversification in rice farming.	4.38	0.64	Strongly Agree	Very High Knowledge
13. My knowledge extends to the use of technology for precise irrigation in rice fields.	4.33	0.67	Strongly Agree	Very High Knowledge
14. I believe that staying informed about farming trends is crucial for successful rice farming.	4.49	0.67	Strongly Agree	Very High Knowledge
Overall Mean	**4.37**	**0.39**	**Strongly Agree**	**Knowledgeable**

* - see Table 1.

Source: Authors' calculation, 2025.

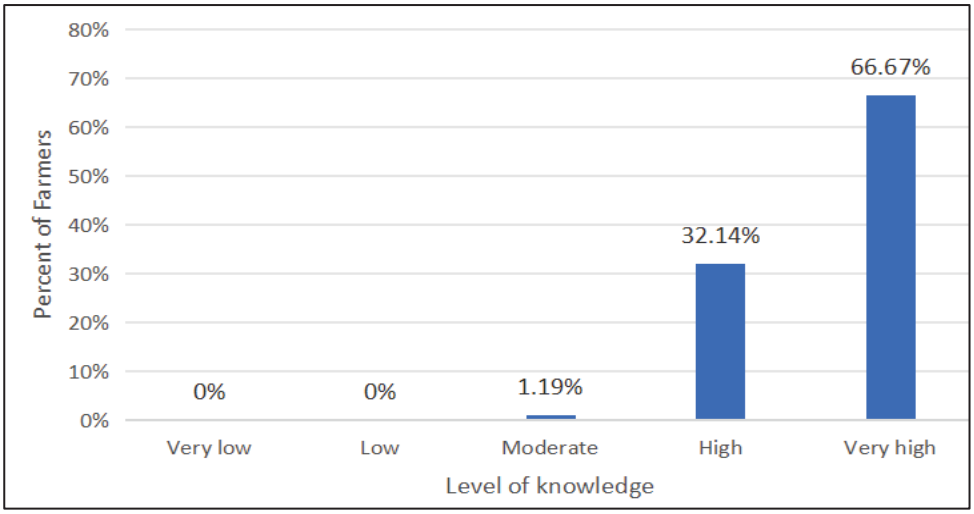

Fig. 1. Rice farmers' level of knowledge

Source: Authors' construction, 2025.

Table 6 shows that all questions about the practices of rice farmers are marked as "strongly agree" except for the integration of irrigation systems. This means that they have "very high practices" of agricultural techniques in improving their farming activities. On average, farmers' perceived practice scores are close to 4.32 (SD=0.41), which can be interpreted as having "very high practices" in farming techniques. In other words, new technologies in agriculture were fully adopted in their farming process. It is depicted in Figure 2 that no farmers have very low or low perceived practice scores in agricultural techniques. On the other hand, only 2.38% of the rice farmers have a moderate level of practice, about 38.10% of them have a high level of practice, and most (59.52%) of them have a very high level of practice in applying innovative agricultural technologies. It is worth noting that, due to the fact that most of them have a very high knowledge of farming activities, they are more likely to apply what they have learned. In fact, advances in agricultural technologies, better varieties of rice, sustainable methods and techniques, precise and efficient farming, and easier access to markets have all helped to improve the production activities of farmers, as well as improve their well-being (Mandal & Singh, 2020; Connor et al., 2021).

Table 6. Farming practices being adopted by farmers

Statement	Mean	SD	Description	Interpretation*
1. I follow recommended planting and harvesting schedules for optimal yield.	4.39	0.54	Strongly Agree	Very High Practices
2. Cover cropping is a part of my rice farming strategy to prevent soil erosion.	4.35	0.65	Strongly Agree	Very High Practices
3. Conservation tillage is a method I adopt to minimise soil disturbance.	4.46	0.59	Strongly Agree	Very High Practices
4. I participate in government-sponsored programs promoting advanced farming practices.	4.32	0.62	Strongly Agree	Very High Practices
5. I employ integrated pest management (IPM) techniques in my rice fields.	4.48	0.55	Strongly Agree	Very High Practices
6. I utilise green manure or organic fertilisers to enrich soil fertility.	4.29	0.87	Strongly Agree	Very High Practices
7. I adapt my farming practices based on weather forecasts and climate conditions.	4.20	0.74	Strongly Agree	Very High Practices
8. I participate in workshops or training sessions to stay updated on new farming practices.	4.27	0.77	Strongly Agree	Very High Practices
9. Precision irrigation systems are integrated into my rice cultivation methods.	4.14	1.09	Agree	High Practices
10. I actively engage in soil testing to ensure the right balance of nutrients.	4.33	0.70	Strongly Agree	Very High Practices
Overall Mean	**4.32**	**0.41**	**Strongly Agree**	**Very High Practices**

* - see Table 1.

Source: Authors' computation, 2025.

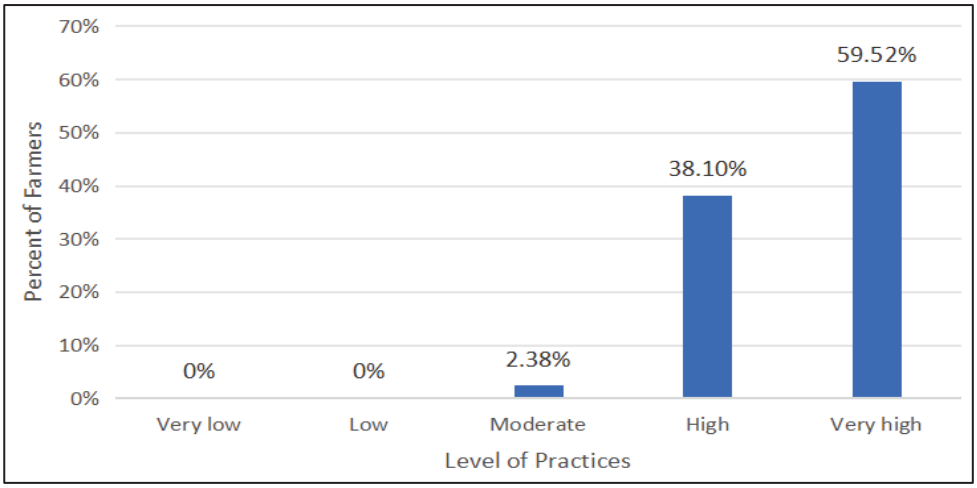

Fig. 2. Rice farmers' level of practices

Source: Authors' construction, 2025.

Table 7 revealed that all production questions are perceived highly by rice farmers, indicating that their farming processes are highly to very highly productive. This implies that rice farming in Barangay Barobaybay, Calbiga, Samar, is performing well from planting to harvesting, which indicates that farmers are equipped for their production and economic activities. On average, farmers' perceived production scores are close to 4.29 (SD=0.39), which can be interpreted as having a "very high production" in farming techniques. Moreover, Fig. 3 revealed that no rice farmers have a very low or low perceived production score. However, about 1.19% of them have a moderate perceived level of production, 35.71% of them have a high perceived level, and 63.10% of them have a very high perceived level. This implies that rice farmers in Barangay Barobaybay, Calbiga, Samar, have an efficient way of farming in which they effectively improve rice production through their high level of knowledge and good practices. In the study by Alzahrani et al. (2023) and Casinillo et al. (2023), it is depicted that if a farmer has good knowledge and has a comprehensive sustainable practice in agricultural techniques, then it is more likely to increase productivity and profitability.

Table 7. Perceived level of rice production of farmers

Statement	Mean	SD	Description	Interpretation*
1. My rice farm consistently achieves high yields per hectare.	4.17	0.76	Agree	High Production
2. I use advanced technology to optimise rice production on my farm.	4.32	0.67	Strongly Agree	Very High Production
3. I follow recommended planting densities to maximise rice output.	4.36	0.61	Strongly Agree	Very High Production
4. Precision farming methods contribute to the efficiency of my rice production.	2.89	1.32	Neutral	Average production
5. I regularly monitor and manage water usage for optimum rice yield.	4.36	0.79	Strongly Agree	Very High Production
6. Efficient nutrient management is a priority in my rice farming for better yields.	4.54	0.57	Strongly Agree	Very High Production
7. I engage in soil testing to make informed decisions on fertiliser application.	4.36	0.69	Strongly Agree	Very High Production
8. I participate in knowledge-sharing networks to enhance rice production techniques.	4.51	0.63	Strongly Agree	Very High Production
9. My farm utilises mechanised equipment to streamline cultivation processes.	4.36	0.80	Strongly Agree	Very High Production
10. I adapt my planting and harvesting schedules based on climate conditions.	4.44	0.65	Strongly Agree	Very High Production
11. I collaborate with agricultural extension services to enhance production skills.	4.48	0.57	Strongly Agree	Very High Production
12. Post-harvest storage and processing methods on my farm ensure quality rice.	4.45	0.63	Strongly Agree	Very High Production
13. I continuously seek ways to improve my rice production through research and training.	4.58	0.61	Strongly Agree	Very High Production
Overall Mean	**4.29**	**0.39**	**Strongly Agree**	**Very High Production**

* - see Table 1.

Source: Authors' computation, 2025.

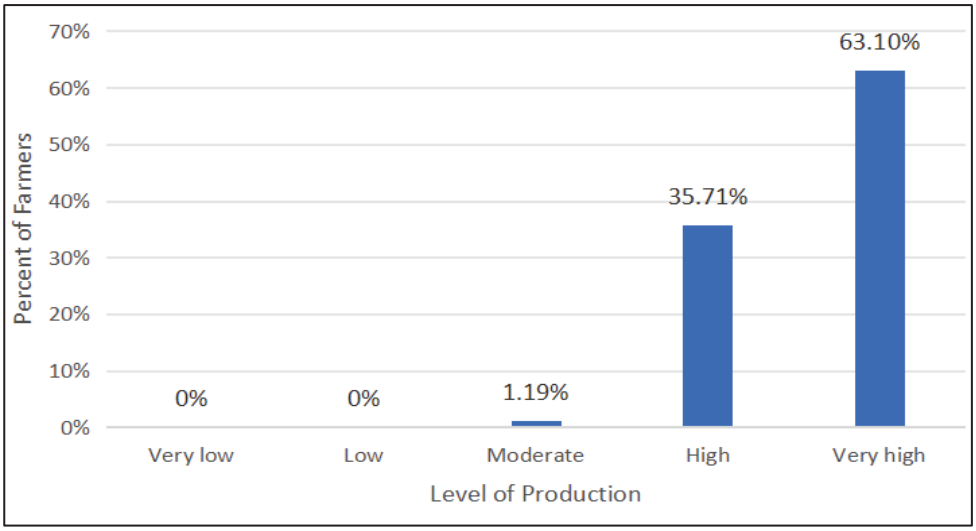

Fig. 3. Rice farmers' level of production

Source: Authors' construction, 2025.

Correlation Analysis

Table 8 shows that the knowledge of rice farmers in Barangay Barobaybay, Calbiga, Samar is highly and significantly correlated (r_s=0.835; p-value<0.001) with their practices at a 1% level. The coefficient of determination (R^2=69.72) indicates that 69.72% of the variations in rice farmers' perceived knowledge can be attributed to their perceived practices, and based on Table 3, the two variables have a strong association. This means that rice farmers are more knowledgeable about modern technologies and are more likely to adopt them in their farming activities, and vice versa. According to Sarma et al. (2022), knowledge of rice farmers is a very important factor in the decision-making of adopting agricultural technology in planting, pest management, irrigation, and harvesting, among others. In addition, it is shown in Table 8 that the knowledge of rice farmers has a strong association (r_s=0.731; p-value<0.001) with their production activities, which is highly significant at a 1% level. The goodness of fit (R^2=53.44) indicates that 53.44% of the differences in rice farmers' perceived knowledge can be attributed to their perceived production level. This implies that if a farmer has good knowledge of farming, production processes are smooth and well-managed through the proper adoption of technologies and decision-making. In the study by Omar et al. (2022), it is vital to enhance farmers' knowledge to improve their techniques in farming management to improve the production level and well-being. Moreover, the practices of rice farmers are highly correlated (r_s=0.769; p-value<0.001) with their production activities, and it is significant at a 1% level. Based on Table 3, perceived practices and perceived production have a strong association. About 59.14% of the differences (R^2=59.14) in rice farmers' perceived practices can be attributed to their perceived production. This means that if a farmer is adopting agricultural technologies, then their production process is performing well and is more likely to be productive. Red et al. (2021)

portrayed that farmers who are adopting more innovative agricultural technologies are more productive in farming activities and more profitable.

Table 8. Spearman correlation matrix for knowledge, practices, and production

Specification	Knowledge	Practices	Production
Knowledge	1.00	0.835* (<0.001)	0.731* (<0.001)
Practices	0.835* (<0.001)	1.00	0.769* (<0.001)
Production	0.731* (<0.001)	0.769* (<0.001)	1.00

* - highly significant at a 1% level.

Source: Authors' computation, 2025.

Ordinal Regression Models

The three (3) regression models in Table 9 do not have a multicollinearity problem (VIF=1.30<10) since the computed variance inflation factor (VIF) is less than 10 (Allison, 2012). It is shown that the three models are not significant (Model 1: p-value=0.171; Model 2: p-value=0.144; Model 3: p-value=0.256); however, the individual test for each independent variable found some significant factors affecting the dependent variable. It is also revealed that the models had just a small model fit based on the coefficient of determination (Model 1: pseudo R^2=0.067; Model 2: pseudo R^2=0.064; Model 3: pseudo R^2=0.055), which indicates that there are only a few predictors that affect the dependent variables of the three models. In that case, there are some factors (other independent variables) in the model that remain unexplained. In Model 1 (Table 9), it is revealed that age (p-value=0.126), sex (p-value=0.258), education (p-value=0.747), and years in farming (p-value=0.850) are not significant factors affecting the knowledge of rice farmers. However, tenurial status (p-value=0.066) is statistically significant at 10% which indicates that it influences the rice farmers' knowledge. The negative coefficient (-0.992) of the tenurial status variable indicates that not being an owner of a rice farm is associated with greater knowledge compared to a farmer who owns their land. This implies that a tenant farmer tends to work hard and learn new techniques to improve their production process and economic activities. In the studies of Robedizo (2015) and Moon et al. (2020), it is portrayed that a farmer under the land tenure system has learned various programs and innovative agricultural techniques and practices to improve their efficiency, productivity, and profitability in farming. In that case, a tenant farmer tends to be more knowledgeable in the farming activities compared to an owner. Moreover, the result of the study is parallel to the findings of Maye et al. (2009), who found that tenant farmers tend to maximise their existing assets and knowledge to obtain their economic goals. As for the second regression model, it is shown that age (p-value=0.185), sex (p-value=0.923), education (p-value=0.789), and years in farming (p-value=0.491) are not significant factors affecting the practices of rice farmers in their agricultural activities.

Nevertheless, the second model depicted that a farmer who is a tenant or renting (p-value=0.071) a rice farm tends to be more likely to adopt innovative agricultural practices to improve the farming activities, and it is significant at a 10% level of significance. This result is consistent with the findings of Red et al. (2021), which showed that farmers who are mostly tenants in status are eager to adopt agricultural technologies to enhance their production yield and economic profit. In the study by Jimena et al. (2025), it is portrayed that innovative knowledge and practices in farming are learned from training and guidance from agricultural extension agents. However, the result of the study does not align with the findings of Carolan (2005), which indicates that tenant farmers have barriers in adopting innovative agriculture on rented farms. Lastly, the third model depicted that age (p-value=0.306), sex (p-value=0.248), education (p-value=0.939), and years in farming (p-value=0.650) are not significant predictors affecting the production level of rice farmers. However, it is revealed that a tenant farmer (p-value=0.10) tends to have productive farming activities, which is statistically significant at a 10% level (Table 9). This implies that farmers who are just tenants or rent their rice farms are more active in improving their production activities. It is mentioned in the study by Hoque et al. (2022) that tenant farmers are supported by some organisations in regard to their farm inputs and activities, including agricultural credit, which could boost their productivity. In fact, farmers are supported by the local government in terms of new technologies and training to improve the economic yield that could progress the national income (Red et al., 2021; Casinillo, 2022; Casinillo et al., 2023).

Table 9. Ordinal regression models

Independent variables	**Dependent variables (1 to 5 scaling)**		
	Model 1: Knowledge	***Model 2: Practices***	***Model 3: Production***
Age (in years)	0.035^{ns} (0.024)	0.029^{ns} (0.022)	0.023^{ns} (0.022)
Male[a]	0.670^{ns} (0.592)	0.052^{ns} (0.535)	0.643^{ns} (0.557)
College[a]	0.241^{ns} (0.749)	0.191^{ns} (0.717)	0.057^{ns} (0.738)
Years in farming[a]	-0.133^{ns} (0.850)	0.453^{ns} (0.658)	0.309^{ns} (0.680)
Owner[a]	-0.992* (0.540)	-0.934* (0.517)	-0.864* (0.532)
Participants	84	84	84
Chi-square test	7.74	8.22	6.55
p-value	0.171^{ns}	0.144^{ns}	0.256^{ns}
Pseudo R^2	0.067	0.064	0.055

a - dummy variable; standard errors are enclosed with parentheses; ns - not significant; *p<0.10.

Source: Authors' calculation, 2025.

Conclusion

This research study aimed to elucidate farmers' knowledge, practices, and production levels in rice farming. The results revealed that the majority of the rice farmers belonged to the prime working ages, and most of them are male with extensive farming experience and primarily elementary-level education. The majority lease their land, with a low percentage of farmers owning land. Moreover, the study concluded that rice farmers display strong knowledge, effective farming practices, and efficient production processes. Furthermore, the results revealed that farmers' knowledge, practices, and production levels are highly associated with each other. Hence, it suffices to say that the farmers possess strong knowledge of fundamental rice farming practices, including soil health, pest management, and modern technologies. Plus, farmers are also highly aware of various innovative technologies, and they are implementing sustainable farming practices, which positively affect their production processes. Moreover, the ordinal regression revealed that tenure status (being a tenant farmer) is a significant factor in farmers' knowledge, practices, and production activities. Thus, to support farmers who lease land, the government should promote policies that provide more secure land tenure, encouraging long-term investment in rice farming. The government should implement comprehensive training programs to help farmers transition from traditional methods to modern farming techniques and technologies, which include providing subsidies for new machinery and techniques. The government should develop mentorship programs where experienced farmers can share their knowledge with younger or less experienced farmers to enhance their skills and practices. One of the limitations of the study is that the regression model reveals a small coefficient of determination, indicating that there are some important regressors that remain unexplained. Hence, the study suggests incorporating other important independent variables (e.g. income, yield, access to credit, infrastructures, extension services, and household expenditures, among others) in the model to strengthen the current findings. Moreover, future studies should include qualitative analysis along with a quantitative approach and focus on other specific areas in Samar, Philippines, to better understand local farming practices, knowledge, and production levels.

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For citation:

Gal M.B., Baculpo K.M.B., Dacara D.C., Davines M.M.A, Gabane A.G., Macawili H.J.B, Casinillo L.F. (2025). Understanding the Knowledge, Practices, and Production Levels of Rice Farmers in Samar, Philippines. *Problems of World Agriculture*, 25(3), 13-30; DOI: 10.22630/PRS.2025.25.3.9