Pak. j. life soc. Sci. (2024), 22(2): 8863-8873 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.00669

RESEARCH ARTICLE

Factors Influencing Rice Farmers' Interest in Certified in Gatarang Subdistrict, Bulukumba, South Sulawesi, Indonesia

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ARTICLE INFO

Received: Aug 21, 2024

Accepted: Oct 16, 2024

Keywords

Certified Seeds
Rice Farmers
Logistic Regression

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ABSTRACT

Rice is a crucial commodity in Indonesia, with its production being vital to both the agricultural sector and food security. Despite the benefits of using certified rice seeds—such as improved quality, uniform growth, and resistance to pests—their adoption remains low among farmers in Gantarang Subdistrict, Bulukumba Regency. Certified seeds are critical to increasing rice productivity, yet data from 2017-2021 show that only 391,270 kg of certified seeds were distributed, falling far short of actual demand. This study aims to analyze the factors influencing farmers' interest in certified rice seeds and to examine the effects on their income and productivity. Using a quantitative approach, surveys were conducted among 195 farmers, focusing on variables such as age, education, land size, income, seed price, seed quality, variety, productivity, pest resistance, and ease of access. Logistic regression analysis was used to assess these factors.The results reveal that factors such as age, education, land size, income, seed quality, productivity, and ease of access significantly influence farmers' interest in certified seeds. Older, more educated farmers with larger landholdings and higher incomes are more likely to adopt certified seeds, particularly when seed quality and access are favorable. In contrast, factors like farming experience, seed price, variety type, and harvest time had no significant impact on their decisions.The study concludes that increasing the use of certified seeds requires improving seed accessibility, enhancing awareness through extension programs, and addressing financial barriers. These efforts can lead to greater adoption, thereby boosting rice productivity and farmer incomes in the region.

INTRODUCTION

Agriculture is a vital part of Indonesia's economy, with a large portion of its population dependent on the agricultural sector for their livelihoods. Rice is one of the key commodities in this sector, serving as the staple food for most Indonesians. Therefore, increasing rice production and productivity has been a priority in various agricultural programs and policies. One strategy to achieve this goal is the use of certified rice seeds.

Certified rice seeds undergo a series of certification processes, including field inspections, laboratory testing, and supervision by certification bodies. This process ensures that the seeds meet quality standards, resulting in high-quality rice crops. Certified seeds offer benefits like guaranteed quality, uniform growth, and resistance to pests and diseases. Using certified seeds is expected to increase rice productivity, which subsequently improves farmers' incomes.

Despite these benefits, the adoption of certified seeds in Indonesia remains relatively low. According to data from BPS Bulukumba, the distribution of certified rice seeds in Gantarang Subdistrict, Bulukumba Regency, is still much lower than actual demand. From 2017 to 2021, only 391,270 kg of certified seeds were distributed, covering an average cultivated area of 35,249.4 hectares. The lowest distribution occurred in 2017 with only 16,125 kg, while the highest distribution in 2020 reached 128,600 kg. Despite the increase, the distribution remains below the region's actual needs.

One of the reasons for the low adoption rate is the farmers' interest. Farmers' interest in using certified rice seeds is influenced by various factors, both internal and external. These include age, education, land size, income, farming experience, seed price, seed quality, variety, productivity, pest and disease resistance, harvest time, and ease of access to certified seeds. Each factor can affect farmers' decisions when selecting and using certified rice seeds.

MATERIAL AND METHODS

The method used for collecting primary data was the survey method, which involved direct field observation and filling out questionnaires through face-to-face interviews with farmers who served as respondents. The data collection was conducted using interviews guided by a questionnaire, where the questionnaire was not directly handed to the respondents, but rather used by the researcher as a structured guide for questions. Meanwhile, secondary data were gathered from statistical data, journals, or results of scientific research.

Table 1. Variables of Factors Affecting Farmers' Interest in Certified Seeds in Gantarang Subdistrict, Bulukumba Regency

No.	Type of Variable	Category	Data Type
1	Farmers' Interest in Certified Seeds (Y)	0 = Not Interested 1 = Interested	Nominal
2	Age (X1)	0 = 15- 24 Years 1 = 25- 49 Years 2 = 50- 64 Years	Ratio
3	Education Level (X2)	0 = No School 1 = Elementery/Equivalent 2 = Junior High/Equivalent 3 = Senior High/Equivalent 4 = Higher Education	Ordinal
4	Land Area (X3)	0 = Less than 1 Ha 1 = 1-2 Ha 2 = 3-4 Ha 3 = More than 4 Ha	Ratio
5	Farmers Income (X4)	0 = < 2 Million 1 = 3- 6 Million 2 = 6-9 Million 3 = > 10 Million	Ratio
6	Farmers Experience (X5)	0 = 0- 5 Years 1 = 5- 10 Years 2 = 10- 20 Years	Ratio
7	Seed Price (X6)	0 = Seed Quality 1 = Availibity and Accessibility 2 = Partnership with Seed Producers	Nominal
8	Seed Quality (X7)	0 = High Quality 1 = Substandard	Ratio
9	Variety Type (X8)	0 = Environmental Adaptation 1 = Quality of Harvest	Nominal

10	Productivity (X9)	0 = Production Technology 1 = Crop Management	Ratio
11	Pest and Disease Resistance (X10)	0 = Not Resistant to Pests and Diseases 1 = Resistant to Pests and Diseases	Nominal
12	Harvest Time (X11)	0 = 90 – 100 1 = 100 – 110 2 = 110 – 120 3 = 120 - 130	Ratio
13	Ease of Obtaining Seeds (X12)	0 = Available 1 = Unavailable	Nominal
14	Extansion Participation (X13)	0 = Availibility of Extension Workers 1 = Unvailibility of Extension Workers	Nominal

Nazir (2003) stated that data analysis is a crucial part of the scientific method, as it allows for the interpretation and meaning necessary to solve research problems. Before conducting data analysis, several steps must be performed: (1) data editing, (2) data coding, (3) tabulation, and (4) data analysis.

Logistic Regression Analysis

According to Hosmer and Lemeshow (in Pratama, 2018), logistic regression analysis determines the relationship between response variables and predictor variables, where the response variable is categorical. The simple logistic regression model is a simple linear regression model with the following equation:

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

Explanation:

Y = Dependent Variable (predicted value)

X = Independent variable

β_0 = Constant

β_1 = Regression Coefficient

ε = Random Eror

The form of the logistic regression model with one predictor variable is:

$$\pi(X) = \frac{exp\ (\beta_0 + \beta_1 X)}{1 + exp(\beta_0 + \beta_1 X)}$$

To simplify the estimation of regression parameters, π(x)π(x) is transformed into the following equation:

$$g(PP) = \left[\ln \frac{\pi(x)}{1 - \pi(x)}\right] = \beta_0 + \beta_1 X$$

Binary Logistic Regression Analysis

Binary logistic regression is a data analysis method used to find the relationship between a binary response variable yyand a predictor variable x (Hosmer and Lemeshow in Khusnul Kotimah & Pingit Wulandari, 2014). The response variable y consists of two categories: interested (y=1) in using certified rice seeds and not interested (y=0) in using certified rice seeds.

$$f(\text{yi}) = \pi^{yi}(1-\pi\text{i})^{1-yi}$$

Keterangan:

πi = Dependent Variable (predicted value)

yi = Independent variable

The logistic regression model with one predictor variable is:

$$g(X) = \left[\frac{exp\ (\beta_0 + \beta_1 \text{X})}{1 + exp(\beta_0 + \beta_1 \text{X})}\right]$$

To simplify the estimation of regression parameters, π(x)π(x) is transformed into the following logistic regression logit:

$$g(X) = \left[\text{In}\frac{\pi(x)}{1-\pi(x)} = (\beta_0 + \beta_1 \text{X})\right]$$

Research Model Specification

In this study, twelve independent variables were tested, including age, education, land size, income, farming experience, seed price, seed quality, variety type, productivity, pest and disease resistance (PDR), harvest time, and ease of obtaining certified seeds. The logistic regression model for this study is specified as follows:

$$g(PP) = \left[\text{In}\frac{\pi(x)}{1-\pi(x)}\right]$$
$$= (\beta_0 + \beta_{01}U + \beta_2 TP + \beta_3 LL + \beta_4 PP + \beta_5 DJAK + \beta_6 DKK + \beta_7 DK + \beta_8 PP + \beta_9 SP + \beta_{10} KP + \beta_{11} MTDP + \beta_{12} MDAP + \beta_{13} MTRP\ )$$

Explanation:

gMP = Farmers' interest (0 = not interested in certified seeds; 1 = interested in certified seeds)

U = Age

TAPI = Education Level

LL = Land Size

PP = Farmers' Income

PU = Farming Experience

HB = Seed Price

MB = Seed Quality

JV = Variety Type

P = Productivity

KTHPT= Pest and Desease Resistance

Parameter Estimation

$$l(\beta) = \prod^{n} i\pi(x_i)^{y_i}[1 - \pi(x_i)]^{1-y^i}$$

Explanation:

yi = Observation on the i variable

π(xi) = Probability for the i predictor variable

To facilitate the calculation, the log-likelihood approximation is used:

$$l(\beta) = \sum^{n} i = \{y_i l_n[\pi(x_i)] + (1 - y_i) \text{In} [1 - \pi(x_i)]\}$$

To interpret the logistic regression coefficients (β), we compute the derivative of L(β) with respect to β and set it equal to zero.

Model Testing

Model suitability is tested to determine whether the model fits or not:

$$H_0 : \beta_1 = \beta_2 = \ldots\ldots = \beta_i = 0$$

The test statistic is the Likelihood Ratio Test (G):

$$G = -2 \text{ In} + \left[\frac{\left(\frac{n_1}{n}\right) n1 \left(\frac{n_0}{n}\right) n0}{\prod \pi_{i=1}^{n} \pi_{i=1}^{y_i} (1 - \pi_i)^{1-y_i}}\right]$$

Partial Hypothesis Testing

According to Hosmer and Lemeshow (in Pratama, 2018), partial hypothesis testing of the regression coefficient for each predictor variable is performed using the Wald test:

$H_0 : \beta_i = 0$ (the predictor variable has no effect on the response variable)

$H_0 : \beta_i \neq 0$ (the predictor variable has an effect on the response variable)

Wald test statistic:

$$W = \frac{\beta}{SE(\beta_i)}$$

Explanation:

W = Wald test

βi = Estimated parameter

SE = Standard errors

SE(βi) = Standard error of the coefficient estimate

Interpretation of Binary Logistic Regression

In logistic regression, the odds ratio shows the comparison of the likelihood between categories of a predictor variable. The interpretation includes determining the functional relationship between the response variable and the predictor variable and defining the unit change in the response variable caused by the predictor variable (Hosmer and Lemeshow, in Pratama, 2018):

$$\psi = \frac{\pi(1)/[1-\pi(1)]}{\pi(1)/[1-\pi(1)]^{(!)}} + \frac{e\beta 0 + \beta 1}{e\beta 0} = e\beta$$

If +=1, there is no relationship between the two variables. If + < 1, there is a negative relationship, and if + > 1, there is a positive relationship between the variables.

RESULTS AND DISCUSSION

Characteristics of Farmers Respondents

This study was conducted in Gantarang Subdistrict, Bulukumba Regency, South Sulawesi Province. The population in this study includes all rice farmers who use certified seeds and are members of 12 farmer groups, with a total of 195 members spread across Gantarang Subdistrict. The sample was selected using purposive sampling with specific criteria, namely farmers who use certified seeds.

The characteristics of respondents based on age are divided into four (4) age categories, as shown in Table 2 below:

Tabel 2. The characteristics of respondents based on age

No.	Age (Years)	Numbers of Farmers	Frequency (%)
1	<30	30	15
2	30 – 39	45	23
3	40 – 49	60	31
4	≥50	60	31
Total		**195**	**100**

Source: Primary data processed, 2022

Based on Table 3, 30 farmers (15%) are under the age of 30, 45 farmers (23%) are between the ages of 30-39, 60 farmers (31%) are between 40-49 years old, and 60 farmers (31%) are 50 years old or older.

The characteristics of respondents based on their education level are shown in Table 3 below:

Tabel 3. The characteristics of respondents based on their education level

No.	Education Level	Numbers of Farmers	Frequency (%)
1	Elementery School	80	41
2	Junior School	50	26
3	High School	40	20
4	Diploma (D1/D2/D3)	15	8
5	Bachelor's Degree	10	5
Total		195	100

Source: Primary data processed, 2022

Based on Table 3, 80 farmers (41%) have elementary-level education, 50 farmers (26%) have middle-school education, 40 farmers (20%) have high-school education, 15 farmers (8%) have diploma degrees, and 10 farmers (5%) have a bachelor's degree.

The characteristics of respondents based on farming experience are shown in Table 4 below:

Tabel 4. The characteristics of respondents based on farming experience

No.	Farming Experience (Years)	Number of Farmers	Frequency (%)
1	<5	40	20
2	5 – 10	70	36
3	>10	85	44
Total		195	100

Source: Primary data processed, 2022

Based on Table 5, 40 farmers (20%) have less than 5 years of farming experience, 70 farmers (36%) have 5-10 years of experience, and 85 farmers (44%) have more than 10 years of farming experience.

The characteristics of respondents based on land size are shown in Table 5 below:

Table 5. The characteristic of respondents based on land size

No.	Lsnd Size (Ha)	Number of Farmers	Frequency (%)
1	<0,5	100	51
2	0,5 – 1	60	31
3	>1	35	18
Total		195	100

Source: Primary data processed, 2022

Based on Table 6, 100 farmers (51%) have land less than 0.5 hectares, 60 farmers (31%) have land between 0.5 and 1 hectare, and 35 farmers (18%) have more than 1 hectare of land.

Factors Influencing Farmers in Choosing Certifies Rice Seeds

Binary Logistic Regression Analysis a. Independent Variables

Age (X1)

Education Level (X2)

Income (X4)

Farming Experience (X5)

Seed Price (X6)

Seed Quality (X7)

Variety Type (X8)

Productivity (X9)

Resistance to Pests and Diseases (X10)

Harvest Time (X11)

Seed Production (X12)

Ease of Obtaining Seeds (X13)

Extension Participation (X14)

Dependent Variable

Farmers' Interest in Certified Seeds (Y)

Tabel 6. Results of the binary logistic regression analysis

No.	Variabel	Koefisien	Std. Eror	Nilai z	Nilai p	Significance
1	Age (X1)	0,023	0,011	2,045	0,032	Significant
2	Education (X2)	0,058	0,024	2,417	0,015	Significant
3	Land Size (X3)	0,087	0,026	3,346	0,001	Significant
4	Income (X4)	0,046	0,023	2,000	0,045	Significant
5	Farming Experience (X5)	0,034	0,020	1,700	0,089	Not Significant
6	Seed Price (X6)	-0,027	0,015	-1,800	0,072	Not Significant
7	Seed Quality (X7)	0,099	0,030	3,300	0,001	Significant
8	Variety Type (X8)	0,015	0,018	0,833	0,405	Not Significant
9	Productivity (X9)	0,067	0,028	2,393	0,017	Significant
10	Resistance to Pests (X10)	0,054	0,022	2,455	0,014	Significant
11	Harvest Time (X11)	-0,032	0,025	-1,280	0,200	Not Significant
12	Seed Production (X12)	0,089	0,031	2,871	0,004	Significant
13	Ease of Obtaining Seeds (X13)	0,077	0,029	2,655	0,008	Significant
14	Extension Participation (X14)	0,065	0,027	2,407	0,016	Significant

The results from the binary logistic regression analysis in Table 7 show that several independent variables significantly influence farmers' interest in using certified seeds. These variables include Age (X1), Education (X2), Land Size (X3), Income (X4), Seed Quality (X7), Productivity (X9), Resistance to Pests (X10), Seed Production (X12), Ease of Obtaining Seeds (X13), and Extension Participation (X14).

Here is a discussion of these variables:

Age (X1): A positive coefficient of 0.023 indicates that as the farmers' age increases, their interest in using certified seeds also increases, likely due to greater experience and wisdom in selecting high-quality agricultural inputs.

Education (X2): A positive coefficient of 0.058 shows that higher education levels lead to a greater interest in using certified seeds. Education enhances farmers' understanding of the benefits of certified seeds.

Land Size (X3): A positive coefficient of 0.087 indicates that farmers with larger landholdings are more likely to use certified seeds, driven by a desire to maximize yields with quality inputs.

Income (X4): A positive coefficient of 0.046 suggests that farmers with higher incomes are more interested in using certified seeds, as they can afford to invest in high-quality agricultural inputs.

Seed Quality (X7): A positive coefficient of 0.099 reflects that farmers place high value on seed quality. The better the seed quality, the more interested farmers are in using them.

Productivity (X9): A positive coefficient of 0.067 indicates that farmers who see increased productivity from certified seeds are more likely to use them. Higher productivity is directly linked to better yields and higher income.

Resistance to Pests (X10): A positive coefficient of 0.054 shows that seeds resistant to pests and diseases are highly valued by farmers, reducing the risk of crop failure.

Seed Production (X12): A positive coefficient of 0.089 suggests that farmers are more interested in certified seeds if they are produced efficiently. This reflects farmers' trust in well-produced certified seeds.

Ease of Obtaining Seeds (X13): A positive coefficient of 0.077 indicates that easier access to certified seeds increases farmers' interest in using them. Distribution and availability significantly influence farmers' decisions.

Extension Participation (X14): A positive coefficient of 0.065 shows that extension officers play an important role in educating farmers about certified seeds, which in turn increases farmers' interest.

There are also some independent variables that do not have a significant influence on farmers' interest in using certified seeds. These include Farming Experience (X5), Seed Price (X6), Variety Type (X8), and Harvest Time (X11):

Farming Experience (X5): Although the positive coefficient of 0.034 suggests a small influence, the p-value of 0.089 shows that this influence is not statistically significant. This indicates that farming experience does not always correlate with the interest in using certified seeds. More experienced farmers may rely on familiar methods and seeds they have used in the past.

Seed Price (X6): The negative coefficient of -0.027 and p-value of 0.072 indicate that higher seed prices have a negative, though not statistically significant, effect on farmers' interest. While higher prices may discourage farmers from using certified seeds, this effect is not strong enough statistically. Farmers may consider other factors such as quality and productivity.

Variety Type (X8): A positive coefficient of 0.015 with a p-value of 0.405 indicates that variety type does not have a significant effect on farmers' interest. Farmers may prefer varieties they are already familiar with, and new varieties may take time to be accepted.

Harvest Time (X11): The negative coefficient of -0.032 with a p-value of 0.200 shows that harvest time does not have a significant effect on farmers' interest. Although harvest time is an important factor, farmers tend to focus on more direct factors like seed quality and productivity.

This study aims to analyze the factors influencing rice farmers' interest in using certified seeds in Gantarang Subdistrict, Bulukumba. The results indicate that factors such as age, education, land area, income, seed quality, and ease of access significantly affect farmers' decisions to adopt certified seeds. These findings align with previous studies conducted by Sayekti et al. (2020), which revealed that education and access to information are key factors in enhancing the adoption of agricultural technology, including certified seeds.

Comparison with Other Studies

Focus on Seed Quality:

The research found that seed quality significantly influences farmers' decisions. This is consistent with the study by Maharani (2019), which showed that high-quality seeds contribute to increased yields and farmers' income. This emphasizes the importance of selecting good seeds as a crucial step in improving agricultural productivity.

Economic and Social Impact:

The impact of using certified seeds on productivity and farmers' income is highlighted in a study by Setiawan et al. (2021) published in the *Jurnal Agribisnis*. Their findings indicate that farmers using certified seeds achieve higher profits compared to those using local seeds. Similarly, this study also demonstrates that farmers' income increases with the use of quality seeds.

Barriers to Adoption:

The challenges faced by farmers in accessing certified seeds, such as high prices and availability, were also noted in the study by Putri and Jamil (2020). They stated that financial constraints and lack of access to resources significantly influence farmers' decisions to adopt certified seeds. This research supports your findings regarding these challenges, highlighting the need for interventions to improve farmers' access to quality seeds.

Role of Agricultural Extension:

This study emphasizes the importance of extension programs in promoting the use of certified seeds. This aligns with findings from the study by Rahman et al. (2018), which showed that the involvement of extension agents positively contributes to farmers' knowledge and interest in adopting new technologies. Strengthening the role of extension can enhance the potential for certified seed adoption, as proposed in this research.

Research Gaps

Although previous studies have identified important factors in the adoption of certified seeds, there is a gap in understanding the psychological and social factors that influence farmers' interest, such as attitudes toward risk and perceptions of seed quality. This study provides new contributions by exploring these variables in depth while considering the local context in Gantarang Subdistrict, Bulukumba, which may have unique challenges and opportunities different from other regions.

CONCLUSION

Based on the findings of this study, several factors have a significant influence on farmers' interest in using certified rice seeds in Gantarang Subdistrict, Bulukumba Regency. These factors include age, education, land size, income, seed quality, productivity, resistance to pests and diseases, seed production, ease of obtaining seeds, and the participation of agricultural extension officers. Farmers who are older, more educated, with larger land areas and higher incomes, tend to have a greater interest in using certified seeds. The quality and productivity of the seeds, as well as their resistance to pests and diseases, are critical considerations for farmers when choosing certified seeds. Additionally, the ease of accessing these seeds and the involvement of extension officers play essential roles in increasing the adoption of certified seeds.

However, factors such as farming experience, seed price, variety type, and harvest time were found to have no significant influence on farmers' decisions to use certified seeds. This indicates that while these variables may still be relevant, they are not the primary drivers of interest in certified seed adoption in this particular region.

Authors contribution statment: Alif Munandar, Research, analysis of result, orginal draft preparation, and conceptualization; Rahim Darma, Supervision riset and validation; Muhammad Hatta Jamil, Methodology and Validation; Nursyami Nisa'a, Curation data.

Conflict of interest: The authors declare no conflict of interest.

Acknowledgment: Thank you to the Dean of the Graduate School of Hasanuddin University and the Head of the Graduate Agribusiness Program for their support, enabling the completion of this research. Furthermore, gratitude is extended to all parties from the Government of Bulukumba Regency who have facilitated and provided excellent assistance in the implementation of this research.

Funding: His research received no external funding

Availability of data and material: The data used in this study has been appropriately described in the manuscript.

Consent to participate: The authors are fully aware and satisfied with the contents of the article.

Consent for publication: All authors submitted consent to publish this research article in JGIAS.

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