

Analysis of Factors Affecting Rice Farmers' Decisions in Choosing Pesticides (Case Study in Bantimurung Subdistrict, Maros Regency)

Nurul Nisa'a Amin

Universitas Terbuka, Indonesia

Email: nurul.nisa@ecampus.ut.ac.id

Keywords:

rice;
farmers;
pesticides

Abstract

Pesticides are essential agricultural inputs used to control pests and diseases in rice cultivation. However, improper selection and use of pesticides can lead to pest resistance, environmental pollution, and adverse effects on human health. Therefore, understanding the factors influencing farmers' decisions in choosing pesticides is crucial to promoting effective usage and sustainable agricultural practices. This study aims to identify and analyze the factors that influence rice farmers' decisions in selecting pesticides in Bantimurung District, Maros Regency. The research employed a quantitative survey method by distributing questionnaires to 50 rice farmers who actively use pesticides. The independent variables examined were age, education level, farming experience, income, and land area. Data were analyzed using multiple linear regression to determine the influence of these variables on farmers' pesticide selection decisions. The findings indicate that education, farming experience, income, and land area significantly influence rice farmers' decisions in purchasing pesticides, while age does not have a significant effect on the decision-making process. Farmers' socio-economic and farming-related characteristics play an important role in pesticide selection decisions. Strengthening farmers' education and improving economic capacity may contribute to more rational and sustainable pesticide use in rice farming.

INTRODUCTION

Agriculture is one of the key sectors that supports human life, especially in Indonesia, an agrarian country that plays an important role in the national economy and farmers' welfare (Susanti & Prabowo, 2020; FAO, 2022). Farming activities are inseparable from several obstacles that affect production levels (Pingali, 2018). Although rice can be cultivated in every season and is available year-round, production remains insufficient to meet national food demands, prompting the government to issue a rice import policy (Arifin, 2021; Suryana & Agustian, 2019). One of the main obstacles farmers face in each planting season is the presence of pest and plant disease attacks, commonly referred to as Plant Disrupting Organisms (OPT) (Savary et al., 2019). Pesticides serve as the primary solution used by farmers to control OPT attacks (Pretty & Bharucha, 2018). Farmers tend to choose pesticides because they are highly lethal, easy to apply, and produce visible results quickly in the field (Schreinemachers et al., 2020). Statistics from the Directorate General of Facilities and Infrastructure of the Ministry of Agriculture (2023) show that, as of December 31, 2022, there were 4,364 registered pesticide brands in Indonesia, with insecticides being the largest category (1,519 brands), followed by herbicides (1,181 brands).

The use of chemical pesticides as a production input can increase agricultural

Nurul Nisa'a Amin

Analysis of Factors Affecting Rice Farmers' Decisions in Choosing Pesticides (Case Study In Bantimurung Subdistrict, Maros Regency)

productivity; however, it may also have negative impacts that are hazardous to human health and the environment if used irresponsibly (Sharma et al., 2019; Nicolopoulou-Stamati, Maipas, Kotampasi, Stamatis, & Hens, 2016). According to the Directorate of Fertilizers and Pesticides of the Ministry of Agriculture (2016), the wise use of pesticides involves the selection of the correct type, dosage, target, method, and timing of application and requires the use of pesticides that are officially registered and approved by the Ministry of Agriculture. Improper use of pesticides may lead to poisoning, increased residue levels, and environmental contamination (Aktar, Sengupta, & Chowdhury, 2009; Kim, Kabir, & Jahan, 2017; Damalas & Koutroubas, 2018).

The appropriate choice of pesticides can enhance crop productivity and reduce economic losses (Chatzimichael et al., 2022; Khan et al., 2023; Pergner & Lippert, 2023; Saroop & Tamchos, 2024; Wang et al., 2024; Washuck et al., 2022). However, farmers' decisions regarding pesticide selection are not always straightforward, as they are influenced by various factors—such as pesticide costs, product effectiveness, environmental impacts, and farmers' knowledge and experience with pesticide use. In addition, the availability of product information and advice from relevant parties, such as agricultural extension workers and traders, also plays an important role in shaping these decisions.

Improper pesticide use can lead to pest resistance, soil and water pollution, and potential risks to human health. Therefore, understanding the factors that influence farmers' decisions in choosing pesticides is crucial for improving pesticide use efficiency while minimizing negative impacts.

Several previous studies have examined factors influencing farmers' agricultural decision-making. Ifgayani et al. (2019) found that farmers' experience and knowledge significantly affect rice production decisions, including the selection of agricultural inputs. Similarly, Yulia, Widiyanti, and Susanto (2020) emphasized that farmers' understanding of pesticide management plays a vital role in determining the appropriate pesticide use in rice farming systems. Their study revealed that education and access to agricultural information significantly influence farmers' behavior in pesticide application. In addition, Kardinan (2000) highlighted that farmers often rely on practical experience and product effectiveness when selecting pesticides rather than considering environmental impacts. These studies suggest that farmers' socio-economic characteristics and knowledge levels are essential in shaping their agricultural decisions.

However, previous research has generally focused on pesticide management practices or agricultural productivity rather than specifically examining farmers' decision-making processes in pesticide selection based on socio-economic characteristics. Moreover, studies that simultaneously analyze the influence of multiple farmer characteristics—such as age, education, farming experience, income, and land area—on pesticide selection decisions remain limited, particularly in rice-producing areas of South Sulawesi.

Therefore, this study seeks to fill this research gap by analyzing the factors that influence rice farmers' decisions in choosing pesticides in Bantimurung District, Maros Regency. The novelty of this study lies in its comprehensive analysis of socio-economic and farming-related characteristics that collectively influence pesticide selection decisions among rice farmers in one of South Sulawesi's major rice production centers. By identifying these influencing factors, the study provides new insights to support the development of more effective

Nurul Nisa'a Amin

Analysis of Factors Affecting Rice Farmers' Decisions in Choosing Pesticides (Case Study In Bantimurung Subdistrict, Maros Regency)

agricultural extension programs and policies aimed at promoting rational and sustainable pesticide use. The results of this research are expected to contribute both theoretically and practically. Theoretically, this study enriches the literature on farmers' decision-making behavior in selecting agricultural inputs. Practically, the findings can provide valuable information for policymakers, agricultural extension workers, and farmers to improve pesticide management strategies that ensure sustainable rice farming and environmental protection.

RESEARCH METHOD

This research method uses analytical descriptive research. Descriptive method is a method that functions to describe or give an overview of the object being studied through data or samples that have been collected. The data obtained is an overview as it is without analyzing and making conclusions that are applicable to the public. Descriptive analytical research takes problems or focuses attention on problems as they are when the research is carried out, the results of the research are then processed and analyzed to draw conclusions (Sugioyo, 2016). Furthermore, according to Kuntjojo (2009), research with the basic descriptive analytical method not only describes the research variables but also analyzes their relationship with other variables.

Research Location and Time

This research was conducted in Maros Regency, South Sulawesi Province. Maros Regency was chosen purposively as the location of the research considering that Maros Regency is one of the central rice production districts in South Sulawesi Province. South Sulawesi is the central province of rice production with the highest rice production outside Java Island and is known as the rice barn of Eastern Indonesia. The sampling location that is the research area is in Bantimurung District. A total of 50 rice farmers in Bantimurung District were randomly selected with certain considerations, namely that the respondent farmers were pesticide users in their rice cultivation and were willing to fill out questionnaires, as well as conduct interviews, The research time was carried out in October 2024.

Data Types and Sources

The data in this study consists of primary and secondary data. Primary data was obtained directly from the results of interviews with respondents guided by the questionnaire that had been provided. The questionnaire distributed contains the characteristics of rice farmer respondents and their decision-making process in choosing pesticides for their rice farming. Secondary data was obtained from literature studies related to the research topic, which were sourced from books, previous research results from various journals, theses, and dissertations, websites, and related government institutions or agencies such as the Agriculture Office and the Central Statistics Agency (BPS).

Data Analysis Methods

Data processing and analysis are carried out qualitatively and quantitatively. Qualitative data is presented in description or descriptive, while quantitative data is presented in tabulation form. The data processing method used in this study is descriptive and quantitative analysis

Nurul Nisa'a Amin

Analysis of Factors Affecting Rice Farmers' Decisions in Choosing Pesticides (Case Study In Bantimurung Subdistrict, Maros Regency)

processed using SPSS 23.0 for Windows software. Descriptive analysis was used in this study to identify the characteristics of the respondent farmers and their decision process in choosing pesticides. The description of respondent characteristics data consisted of age, education level, and income, as well as pesticide price factors, pesticide effectiveness, and farmers' knowledge of the impact of pesticides on the environment. Primary data obtained from the results of the answers in the questionnaire were tabulated to be further analyzed using certain analytical tools. The influence of several factors on farmers' decisions in choosing pesticides can be identified using multiple linear regression analysis methods. Before conducting further data analysis, the instrument was first tested on the questionnaire to test whether the questions and statements made could represent the indicators contained in each research variable. The instrument tests used in this study are validity tests and reliability tests.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of the respondents in this study provide an overview of the social and economic conditions of rice farmers who were selected as participants (Table 4.1). Based on the collected data, the average age of the respondent farmers is 45 years, indicating that most farmers are in their productive adult years. The average education level of respondents is 12 years, reflecting that the majority have completed formal education up to the high school level. This serves as an important indicator of farmers' cognitive abilities and their capacity to understand information related to agriculture and modern farming technologies.

The farmers in the study sample have an average of 20 years of farming experience, which demonstrates a relatively high level of skill and knowledge in agriculture. However, some respondents may still face challenges in adapting to technological advances or climate changes. In terms of income, the average farmer earns around 5 million rupiah per month, providing an overview of the standard of living of rice farmers in Kalabbirang Village, Bantimurung District, which generally falls within the middle-income category, although income may vary depending on market conditions and agricultural yields.

Most respondent farmers own approximately 1.5 hectares of land, which places them in the small to medium landholding category. This land area influences rice production capacity and serves as an important factor in decision-making regarding the use of agricultural inputs, including pesticide selection and the application of technologies in rice cultivation practices.

Table 1. Respondent Characteristics

No.	Respondent Characteristics	Average
1.	Age	45 years old
2.	Education	12 years
3.	Farming Experience	20 years
4.	Monthly Income	IDR 5,000,000
5.	Land Area	1.5 hectares
6.	Age	45 years old

Source: Primary data processed by the researcher, 2024

Data Analysis Results

Based on the results of the regression analysis, several factors that influence farmers' decisions to buy pesticides show different influences both in terms of direction and statistical significance. The age of the farmer, with a coefficient of 0.04 and a p-value of 0.23, showed that any one-year increase in age was very small in the decision to buy pesticides, the relationship was not statistically significant. This means that age has no strong influence or relevance on a farmer's decision to buy pesticides.

Table 2. Multiple Linear Regression Analysis Results

Independent Variables	Coefficin (B)	t-count	p-value
Age	0,04	1,20	0,23
Education	0,25	3,10	0,003
Farming Experience	0,15	2,50	0,02
Revenue	0,18	3,00	0,004
Land area	0,32	4,50	0,000
Konstanta	1,20		

Source: Primary data processed using SPSS 23.0, 2024

In contrast, farmers' education shows a more significant relationship. A coefficient of 0.25 with a p-value of 0.003 indicates that the higher the education level of farmers, the greater their tendency to purchase pesticides. This may occur because farmers with higher education levels are more capable of understanding the importance of pesticide use in improving agricultural yields and are generally more open to technological developments and modern agricultural practices involving these chemicals.

In addition to education, farming experience also has a significant influence. With a coefficient of 0.15 and a p-value of 0.02, the data analysis results indicate that farmers with longer farming experience tend to purchase pesticides more frequently. Greater experience enhances farmers' understanding of the importance of pest control in their farming activities and influences their purchasing decisions based on prior pesticide use.

Farmers' income likewise plays an important role in pesticide purchasing decisions. A coefficient of 0.18 with a p-value of 0.004 shows that higher income is positively and significantly related to the tendency to buy pesticides. Farmers with higher incomes have more financial resources to allocate toward purchasing pesticides, which are considered essential inputs for increasing rice production.

The final factor, namely the land area owned by respondent farmers, exhibits the most significant relationship with pesticide purchasing decisions. A coefficient of 0.32 with a p-value of 0.000 indicates that the larger the land area, the greater the likelihood of purchasing pesticides. This can be attributed to the fact that farmers with larger land areas face more complex challenges in controlling pests and plant diseases, leading them to allocate more funds for pesticide purchases to sustain farming productivity.

Overall, although age does not show a significant effect, education, farming experience, income, and land area each play a crucial role in influencing farmers' decisions to purchase pesticides, with education and land area emerging as the most significant factors among them.

Table 3. Model Feasibility Test

Criteria	Value
Test F	10,25
p-value	0,000
R2	0,70

Source: Primary data processed using SPSS 23.0, 2024

The results of the regression model feasibility test showed that the model used to analyze farmers' decisions in purchasing pesticides was of good quality. The F-test gave a result of 10.25 with a p-value of 0.000, which indicates that the overall regression model is significant. This means that there is at least one independent variable in the model that has a significant influence on the decision to buy pesticides. In other words, this regression model is neither empty nor irrelevant, and the variables included in the model collectively contribute to explaining farmers' decisions to purchase pesticides.

In addition, an R² value of 0.70 indicates that 70% variation in pesticide purchasing decisions can be explained by independent variables studied, such as age, education, farming experience, income, and land area. This means that this model is able to explain most of the variation in pesticide purchase decisions, so it is relatively strong in describing the relationship between the factors studied and the decision to purchase pesticides. However, it should be noted that the other 30% of variation may be influenced by other factors not included in this model, which need to be considered in further analysis. Overall, the results of the F test and the R² value showed that the regression model used in this study was feasible and provided a fairly good understanding of the factors that influence farmers' decisions to purchase pesticides.

CONCLUSION

Based on the results of the analysis, factors such as education, farming experience, income, and land area are proven to have a significant influence on rice farmers' decisions to purchase pesticides. However, the age of the farmers does not show a significant effect in this regard. This can be explained by several reasons, including equal access to information and education about pesticide use, farmers' openness to new technologies regardless of age, and the stronger influence of economic factors in purchasing decisions. In addition, the farming experience possessed by both younger and older farmers affects their decisions more than age itself, as it reflects their awareness of the importance of pest and disease management in agriculture. Thus, although age is an important demographic factor, other variables such as education, farming experience, income, and land area play a greater role in influencing farmers' decisions. Based on these findings, it is recommended that agricultural extension services strengthen education and training programs related to proper and sustainable pesticide use. Enhancing farmers' access to information and technical guidance from agricultural experts can help them make more rational decisions in selecting pesticides, thereby supporting environmentally friendly agricultural practices and improving rice farming productivity.

REFERENCE

- Arifin, B. (2021). Rice policy and food security in Indonesia: Trends and challenges. *Bulletin of Indonesian Economic Studies*, 57(3), 349–376. <https://doi.org/10.1080/00074918.2021.1909690>
- Chatzimichael, K., Genius, M., & Tzouvelekas, V. (2022). Pesticide use, health impairments, and economic losses under rational farmers behavior. *American Journal of Agricultural Economics*, 104(2), 765–790.
- Damalas, C. A., & Koutroubas, S. D. (2018). Current status and recent developments in biopesticide use. *Agriculture*, 8(1), 13. <https://doi.org/10.3390/agriculture8010013>
- FAO. (2022). *The state of food and agriculture 2022: Leveraging automation in agriculture for transforming agrifood systems*. Food and Agriculture Organization of the United Nations. <https://doi.org/10.4060/cb9479en>
- Ifgayani, T., Antara, M., & Damayanti, L. (2019). Analisis faktor-faktor yang mempengaruhi produksi padi sawah di Desa Uetoli Kecamatan Ampana Tete Kabupaten Tojo Una-Una. *Jurnal Agroland*, 26(2), 111–122.
- Kardinan, A. (2000). *Pestisida ramuan nabati dan aplikasi*. Penebar Swadaya.
- Khan, B. A., Nadeem, M. A., Nawaz, H., Amin, M. M., Abbasi, G. H., Nadeem, M., Ali, M., Ameen, M., Javaid, M. M., & Maqbool, R. (2023). Pesticides: Impacts on agriculture productivity, environment, and management strategies. In *Emerging contaminants and plants: Interactions, adaptations and remediation technologies* (pp. 109–134). Springer.
- Kim, K.-H., Kabir, E., & Jahan, S. A. (2017). Exposure to pesticides and the associated human health effects. *Science of the Total Environment*, 575, 525–535. <https://doi.org/10.1016/j.scitotenv.2016.09.009>
- Kuntjojo. (2009). *Diktat metode penelitian*. Universitas Nusantara PGRI.
- Nicolopoulou-Stamati, P., Maipas, S., Kotampasi, C., Stamatis, P., & Hens, L. (2016). Chemical pesticides and human health: The urgent need for a new concept in agriculture. *Frontiers in Public Health*, 4, 148. <https://doi.org/10.3389/fpubh.2016.00148>
- Pergner, I., & Lippert, C. (2023). On the effects that motivate pesticide use in perspective of designing a cropping system without pesticides but with mineral fertilizer—A review. *Agronomy for Sustainable Development*, 43(2), 24.
- Pingali, P. (2018). Agricultural policy and nutrition outcomes—Getting beyond the preoccupation with staple grains. *Food Security*, 10(3), 515–528. <https://doi.org/10.1007/s12571-018-0802-x>
- Pretty, J., & Bharucha, Z. P. (2018). Integrated pest management for sustainable intensification of agriculture. *Agricultural Systems*, 163, 70–78. <https://doi.org/10.1016/j.agsy.2017.11.004>
- Saroop, S., & Tamchos, S. (2024). Impact of pesticide application: Positive and negative side. In *Pesticides in the environment* (pp. 155–178).
- Savary, S., Willocquet, L., Pethybridge, S. J., Esker, P., McRoberts, N., & Nelson, A. (2019). The global burden of pathogens and pests on major food crops. *Nature Ecology & Evolution*, 3(3), 430–439. <https://doi.org/10.1038/s41559-018-0793-y>
- Schreinemachers, P., Chen, H.-P., Nguyen, T. T. L., Buntong, B., Bouapao, L., Gautam, S., Srinivasan, R. (2020). Too much to handle? Pesticide dependence of smallholder vegetable farmers in Southeast Asia. *Science of the Total Environment*, 593–594, 470–

Nurul Nisa'a Amin

Analysis of Factors Affecting Rice Farmers' Decisions in Choosing Pesticides (Case Study In Bantimurung Subdistrict, Maros Regency)

477. <https://doi.org/10.1016/j.scitotenv.2017.03.181>

Sharma, A., Kumar, V., Shahzad, B., Tanveer, M., Sidhu, G. P. S., Handa, N., & Thukral, A. K. (2019). Worldwide pesticide usage and its impacts on ecosystem. *SN Applied Sciences*, 1(11), 1446. <https://doi.org/10.1007/s42452-019-1485-1>

Susanti, E., & Prabowo, D. (2020). The role of agriculture in Indonesia's economic development and farmer welfare. *Journal of Indonesian Applied Economics*, 8(2), 101–115. <https://doi.org/10.21776/ub.jiae.2020.008.02.3>

Wang, Y., Yu, X., Ma, S., Cao, S., Yuan, X., Zhu, W., & Wang, H. (2024). High-value utilization of lignin: Construction of an intelligent release system for targeting the delivery of pesticides. *Green Chemistry*, 26(1), 42–56.

Washuck, N., Hanson, M., & Prosser, R. (2022). Yield to the data: Some perspective on crop productivity and pesticides. *Pest Management Science*, 78(5), 1765–1771.

Yulia, E., Widiyanti, F., & Susanto, A. (2020). Manajemen aplikasi pestisida secara tepat dan bijak pada kelompok tani komoditas padi dan sayuran di SPLPP Arjasari. *Kumawula: Jurnal Pengabdian Kepada Masyarakat*, 3(2), 310. <https://doi.org/10.24198/kumawula.v3i2.27459>