

## Montong Durian Farmers' Behavior in Control of Bangkalan Disease in Parigi Moutong Regency, Central Sulawesi

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### ABSTRACT

The presence of bangkalan disease has proven detrimental to Montong durian farmers in Parigi Moutong. Various control efforts have been made but have yielded no significant results. This study aims to determine the behavior of Montong durian farmers in controlling the attack of bangkalan disease. The study was conducted in Parigi Moutong Regency, Central Sulawesi, specifically in Tolai Village (Torue District), Buranga Village (Ampibabo District), and Sumber Sari Village (South Parigi District), using quantitative methods and survey techniques with structured questionnaires and in-depth interviews involving 10 farmers from each village, totaling 30 respondents. The findings indicate that farmers' knowledge about the causes of bangkalan disease falls into the low category. Adequate levels of education and years of farming experience have not provided effective solutions to overcome the problem. Farmers generally expressed dissatisfaction with pesticide-based control methods, even though they have had to increase both the frequency and dosage of application. Because the causative agent of bangkalan disease has not yet been identified, many Montong durian farmers have chosen to cease treatment and harvesting, as the risk of loss is too great. This phenomenon reflects a strong relationship between uncontrollable biotic factors and the social as well as psychological dynamics of the farmers. Plant diseases not only threaten productivity but also erode farmers' hopes for successful harvests. Consequently, their impacts extend to the behavioral and mental well-being of Montong durian farmers, which may eventually endanger the sustainability of the agricultural production system in affected regions—in this case, the future potential of Montong durian cultivation in Parigi Moutong Regency.

**Keywords:** Bangkalan Disease, Montong Durian, Farmer Behavior, Parigi Moutong

### INTRODUCTION

Indonesia's agricultural sector, with its vast land potential and favorable tropical climate, plays a vital role in the national economy and food security. However, this sector continues to face persistent challenges from plant pests and diseases that significantly threaten crop productivity and quality. For high-value export commodities, particularly horticultural products, disease outbreaks can have serious economic repercussions, reducing both farmers' income and foreign exchange earnings (Ministry of Agriculture, 2023) (Aboushady, Kornher, & Zaki, 2024; Netecha, 2023). Effective disease management is therefore essential, not only to sustain farmer livelihoods but also to maintain Indonesia's competitiveness in the global market (Irawan, 2025; Sudomo et al., 2023).

Among these leading commodities, the Montong durian (*Durio zibethinus* Murr) is considered a strategic crop due to its high economic value, export potential, and strong demand in both domestic and international markets (Setiawan, 2024; Parniati et al., 2022; Thongkaew et al., 2021). Its thick, delicious flesh, low fat content, and smooth texture make the Montong durian a highly sought-after fruit (Zulfahmi et al., 2022; Romadloni et al., 2024). Data from the Central Sulawesi Province Food Crops and Horticulture Service indicate that the total registered durian plantation area reaches approximately 3,056.41 ha, spread across Parigi Moutong Regency, Sigi Regency, Poso Regency, Tolitoli Regency, and Donggala Regency. This extensive land potential provides a significant advantage, as it can contribute to boosting

the national economy through export activities (Noerhidaya et al., 2023). In 2024, the Food Crops and Horticulture Service recorded durian productivity in Central Sulawesi Province at 743,256 quintals.

Parigi Moutong Regency is one of the regions in Central Sulawesi with major potential for producing Montong durian due to its suitable topography and fertile soils (Fatoni et al., 2025; Mokoginta, Repi, Suparwata, Rempas, & Dangkoa, 2025). This potential offers substantial economic benefits, supporting both local and national economic growth through export opportunities. However, initial field observations reveal that Montong durian production in Central Sulawesi, particularly in Parigi Moutong Regency, is currently facing a severe threat from a disease known locally as Bangkalan. The term Bangkalan disease is used by durian farmers in Parigi Moutong Regency to describe a quality disorder that affects Montong durian fruit, characterized by a bland taste and a loss of its distinctive aroma, even though the fruit's physical appearance remains normal. The cause of this disease has not yet been confirmed but is suspected to involve fungal or bacterial pathogens.

To combat Bangkalan disease, Montong durian farmers in Parigi Moutong Regency have implemented various control methods, yet these efforts have produced no significant results. Controlling Bangkalan disease is crucial for ensuring the success of Montong durian cultivation. Pesticide use remains a common practice among farmers for managing attacks by plant pest organisms (OPT), but even this approach has been largely ineffective.

Therefore, this study seeks to examine the behavior of Montong durian farmers in managing their crops and controlling Bangkalan disease. The control of Bangkalan pests and diseases is not only determined by available technology but also by farmers' knowledge, perceptions, and behavioral patterns related to the disease. Individual behavior—including that of farmers—in pest and disease management is influenced by motivation, knowledge, attitudes, and the perceived value of control practices. Behavior is enacted when individuals perceive that the positive outcomes outweigh the negative consequences. This encompasses the choice of control methods, use of agricultural inputs, and farmers' knowledge and skills in identifying the causes of Bangkalan disease.

According to (Jaya & Ratnawati, 2025), examining farmer behavior in supporting sustainable agriculture is essential because farmers, as the primary actors in managing natural resources, play a decisive role in ensuring the continuity of agricultural systems in the future. Hence, understanding farmer behavior in controlling Bangkalan pests and diseases is imperative. Providing education and guidance on the factors that influence farmer behavior will help promote proper and sustainable management practices. The research locations were purposively selected considering that the three villages—Tolai, Buranga, and Sumber Sari—are centers of Montong durian cultivation in Parigi Moutong Regency and have experienced severe Bangkalan disease outbreaks that have harmed the farming community.

This study aims to analyze the behavior of Montong durian farmers in controlling Bangkalan disease attacks. A comprehensive understanding of farmer behavior in managing Bangkalan disease is a crucial step toward developing effective and targeted agricultural extension strategies and strengthening the development of high-value commodities. The results of this research are expected to provide valuable insights and recommendations for local governments and stakeholders to formulate more effective and sustainable strategies for controlling Bangkalan disease in durian cultivation areas of Parigi Moutong Regency.

## **METHOD**

This research was conducted from May to June 2024 in Tolai Village, Torue District, Buranga Village, Ampibabo District, and Sumber Sari Village, Parigi Selatan District, Parigi Moutong Regency, Central Sulawesi, Indonesia. The study employed a quantitative research design combined with survey methods. The villages were selected purposively, considering

that these three locations are the centers of Montong durian cultivation in Parigi Moutong Regency. Ten farmers were selected from each village, resulting in a total of 30 respondents. Data collection was carried out through structured questionnaires and in-depth interviews. The in-depth interviews aimed to explore respondents' control techniques and the challenges they encountered when implementing pest and disease management activities. Secondary data were obtained from relevant agencies through institutional surveys.

Respondents were chosen using purposive sampling. Purposive sampling is a technique based on specific criteria relevant to and supportive of the study's objectives. The inclusion criteria included respondents being active farmers with experience in managing Montong durian plantations. The questionnaires collected data on demographic characteristics, control knowledge, perceptions, and farmers' actions in addressing Bangkalan disease in Montong durian plantations. After all data from both questionnaires and interviews had been collected, they were analyzed and described according to the proportional responses of each respondent.

The data analysis techniques employed included descriptive statistical analysis and qualitative content analysis. Quantitative data from the questionnaires were examined using descriptive statistics, presenting frequency and percentage distributions for categorical variables and mean values for continuous variables. Qualitative data from interviews were analyzed through thematic analysis to identify patterns of farmer behavior, perceptions, and attitudes toward Bangkalan disease, as well as challenges in control practices and adaptation mechanisms. To ensure the validity and reliability of the findings, a data triangulation method was applied by integrating results from questionnaires, interviews, and secondary data sources. The analysis focused on understanding the relationship between farmers' demographic characteristics and their behavior in controlling Bangkalan disease, as well as identifying the factors that influence the effectiveness of disease management practices.

## RESULTS AND DISCUSSION

### Results

The results of the study showed that all respondent farmers were male (100%) and generally aged between 46 and 60 years (50–70%), with an education level ranging from junior high school to high school (50–80%) and farming experience of more than 10–20 years (40–50%). The data on respondent characteristics are presented in Table 1.

**Table 1. Characteristics of Montong Durian Farmer Respondents in Parigi Moutong Regency.**

Variable	Tolai Village		Buranga Village		Sumber Sari Villange	
	Respondents	%	Respondents	%	Respondents	%
Gender						
- Male	10	100	10	100	10	100
- Female	0	0	0	0	0	0
Age						
- 31-45	2	20	1	10	2	20
- 46-60	5	50	7	70	6	60
- >60	3	30	2	20	2	20

Variable	Tolai Village		Buranga Village		Sumber Sari Villange	
	Respondents	%	Respondents	%	Respondents	%
Education Level						
- Elementary School	1	10	0	0	0	0
- Junior High School	2	20	3	30	1	10
- Senior High School	6	60	5	50	8	80
- University	1	10	2	20	1	10
Farming Experience						
- <10 Years	4	40	2	20	3	30
- 10-20 Years	4	40	5	50	4	40
- >20 Years	2	20	3	30	3	30

Source: Primary Data Analysis (2024)

The presence of Bangkalan disease is detrimental to montong durian farmers in Parigi Moutong. Various efforts to overcome it have been made, but have not been successful. Durian fruit from farmers infected with Bangkalan disease, images obtained directly from the respondent farmer's garden in Parigi Moutong are shown in Figure 1.



**Figure 1. Image of Durian infected with Bangkalan Disease (Source: Personal Document).**

Source: Field Documentation (2024)

Various pests attack durian montong plants causing their production to decline, but farmers admit that the Bangkalan attack is difficult to overcome, and various efforts have been made, generally using pesticides (80-100%), although they admit they are not satisfied with the control methods that have been used (90-100%) as presented in Table 2.

**Table 2. Constraints and Methods of Controlling Bangkalan Disease Used by Montong Durian Farmers in Parigi Moutong Regency**

Variable	Tolai Village		Buranga Village		Sumber Sari Villange	
	Respondents	%	Respondents	%	Respondents	%
Challenges Faced						
- Plant Pest Attacks Bangkalan Disease	10	100	10	100	10	10
- Venture capital	0	0	0	0	0	0
- Changes in the weather	0	0	0	0	0	0
Types of Control						
- Botanical Pesticides and Biological Agents	1	10	0	0	0	0
- Synthetic Pesticides	8	80	10	100	9	90
- Others	1	10	0	0	1	10
Satisfaction with Control Methods						
- Very Satisfied	0	0	0	0	0	0
- Satisfied	0	0	0	0	0	0
- Less Satisfied	1	10	0	0	0	0
- Dissatisfied	9	90	10	100	10	100

Source: Primary Data Analysis (2024)

The high incidence of Bangkalan disease in Montong durian plants is due to ineffective control methods. Farmers have limited knowledge of the causes of Bangkalan disease. Table 3 shows that Montong durian farmers do not yet have adequate knowledge of the causes of Bangkalan disease, which was categorized as low in the analysis.

**Table 3. Knowledge of Montong Durian Farmers in Parigi Moutong Regency Regarding Bangkalan Disease**

Knowledge Category	Tolai Village	Buranga Village	Sumber Sari Village
Low	5	3	7
Medium	4	5	2
High	1	2	1
Amount	10	10	10
Score average	2	3	3
Category	Low<4	Medium 4-6	High>6

Source: Primary Data Analysis (2024)

The demographic characteristics of respondent farmers in the three villages of Parigi Moutong Regency showed that all were male, generally aged between 46 and 60 years, and commonly had a junior high school (SMP) or high school (SMA) education level (Table 1). The characteristics of respondent farmers, such as age and education level, did not show a significant correlation with their behavior in using pest control techniques for Bangkalan disease. The factors influencing farmers' pest control behavior included habit, ease of application, and perceived effectiveness of the control method (Hidayat et al., 2020). However, it is important to recognize that demographic characteristics, such as age, can reflect levels of maturity that influence pest control decisions, and can therefore affect the implementation of technology. Farmers within the productive age group generally absorb information more quickly. Nevertheless, several studies (Jaya et al., 2015; Jaya et al., 2019; Jaya et al., 2021) have shown that age does not necessarily influence pest control behavior. The findings of this study confirm that, even though farmers were classified as being of productive age, their behavior in controlling and responding to attacks by OPT (Organisme Pengganggu Tanaman)—specifically Bangkalan disease—still depends primarily on the use of synthetic pesticides, which are not environmentally friendly. They continue to experiment with various alternative methods to mitigate the disease without successful results.

A similar pattern emerged when considering education levels. Montong durian farmers mostly completed only junior high or high school education, yet their behavior in managing pests and diseases remained the same—relying heavily on pesticide use, despite not knowing the exact cause of the disease. Education influences the degree to which farmers can absorb information. The higher the level of education, the easier it is for farmers to understand training materials, innovations, or technologies. However, this does not necessarily translate into wiser pest management behavior. Research by Jaya et al. (2019, 2021, 2023) concluded that increased knowledge of pesticides has not directly improved farmers' ability to manage pests according to Integrated Pest Management (IPM) principles. When the cause of the disease remains unknown, farmers tend to rely on trial-and-error methods, increasing pesticide frequency and dosage, which often proves ineffective. This study found that Montong durian farmers' knowledge about the causes of Bangkalan disease falls into the low category (Table 3). The lower the farmer's knowledge level, the higher the quantity of pesticides used—without adequate consideration of their effects on the environment and other organisms (Wagner, 2020; Dennis et al., 2019; Jaya et al., 2022; Fox et al., 2023).

In terms of farming experience, the average Montong durian farmer in Parigi Moutong Regency has cultivated durian for more than 10 years. However, this experience has not translated into the development of effective knowledge or behavior for controlling OPT–Bangkalan disease. Experience is considered an important factor that shapes how farmers respond to OPT attacks on their mother plants. According to (Effendy, 2019) and (Effendy et al., 2020), farmers with greater experience in agricultural activities should possess broader insights than novices. Yet, the reality in the field shows that even experienced Montong durian farmers in Parigi Moutong Regency still struggle to overcome the Bangkalan disease problem effectively.

The exact cause of the Bangkalan disease outbreak remains unidentified. This is due to a lack of scientific understanding of the underlying cause of the disease. Bangkalan refers to a local term for a disorder that causes the flesh of durian fruit to taste bland and tasteless, without any visible visual characteristics before it is opened. However, preliminary suspicions based on field findings suggest a fungal or bacterial infection. Triwidodo et al. (2020) reported that

the most common disease affecting durian seedlings is an attack by pathogenic fungi such as *Corynespora* sp., which causes leaf spots and leaf blight caused by *Rhizoctonia* sp. Root and base stem rot are caused by *Phytophthora palmivora*. The lack of in-depth research on the pathogens associated with this phenomenon has resulted in the lack of empirical data, although various efforts by the government, the Central Sulawesi Agriculture Service, and the Durian Plantation Association (Apdurin) have been made to address the Bangkalan disease outbreak in the Parigi Moutong area, but the results have not been optimal. A report from Adpurin in media coverage (Sultengraya, 2025) stated that the death rate reached 10 to 15 percent per year due to Bangkalan disease attacks.

The lack of sufficient knowledge and information about the causes and effective management of Bangkalan disease has led Montong durian farmers to cease treatment and harvesting activities due to the high risk of losses. Financial losses have reached hundreds of millions of rupiah, with many durian orchards already severely infected. In the field, fallen fruits are often left uncleared, creating new sources of infection from lingering pathogens. Although Montong durian farmers remain highly motivated—given the high profitability of the fruit—the damage caused by Bangkalan disease has discouraged many from continuing durian farming, prompting shifts toward alternative crops such as rice. This trend illustrates how heightened anxiety and risk perception associated with plant diseases can undermine farmer motivation to maintain crop care. The phenomenon further highlights the close interconnection between uncontrollable biotic factors and the social and psychological dynamics of farmers. When plant diseases not only threaten productivity but also erode the hope of a successful harvest, the consequences extend beyond agricultural output—affecting farmers' behavior, emotional well-being, and overall livelihood sustainability. Ultimately, this situation poses a serious threat to the continuity of agricultural production systems in the affected regions, particularly to the long-term potential of Montong durian cultivation in Parigi Moutong Regency.

## CONCLUSION

Based on the findings of the research, it can be concluded that the behavior of Montong durian farmers in Parigi Moutong Regency in controlling Bangkalan disease reflects a low level of knowledge regarding the causes of the disease. The farmers' education level and years of farming experience have not yet provided effective solutions. Moreover, farmers expressed dissatisfaction with existing pesticide-based control practices, even though the frequency and dosage of applications have been continuously increased. These conditions have led to a tendency among farmers to cease maintenance and harvesting activities due to the high risk of financial loss. For future research, it is essential to scientifically identify the pathogens responsible for Bangkalan disease, develop an integrated control technology package tailored to local conditions, and conduct a more in-depth examination of the socio-economic and psychological dynamics of farmers in responding to disease outbreaks. These efforts are crucial to support the long-term sustainability of Montong durian cultivation in the region.

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