Farmers' Response to the Integrated Pest Management Program in Murtigading Village, Bantul, Indonesia

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Abstract. The number of longan plants shows an increase, this is because many farmers see its potential. This condition requires an integrated pest control program in Murtigading Village. This study aims to determine the farmers' response toward integrated pest management program. The method used in this study is scoring, and Spearman Rank for the relationship between variables. The results showed that the category knowledge knew, the category attitude was quite happy, and the actions were done quite a lot by longan farmers. The factors that correlate is quite significant, namely land area with cognitive attitudes, income with cognitive attitudes and income with actions. Meanwhile, the factors that are low correlated are the age factor with cognitive attitudes and affective attitudes, education with cognitive attitudes, land area with affective attitudes and actions, income with affective attitudes. Factors that correlate very low are age with affective attitudes, education with affective attitudes and actions.

1 Introduction

Indonesia is an agrarian country where most of the population lives in the agricultural sector [1]. This agricultural sector is very influential on the economy because most of the Indonesian population works in this sector [2–4]. To meet economic needs, farmers must increase agricultural production, increase exports, increase farmers' income and trade equity are the goals of agricultural development [3]. In Indonesia, longan fruit is one of the fruits that is widely liked by the public. The increasing demand for longan fruit from year to year with the development of the trend of eating fruit among the public.

Longan fruit plants are fruits from China classified as subtropical plants and are not native to Indonesia [5]. Longan fruit has many benefits, ranging from the skin, pulp and even the seeds [6]. Longan is used as a Chinese medicine from ancient times to the present. Longan peel water extract contains antioxidants and anti-inflammatory compounds, while longan fruit seed extract contains antimicrobial compounds derived from phenolic

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compounds [7]. Even farmers can manage the fruiting season of longan fruit plants throughout the year without worrying about the fruit falling. There is a distribution of longan fruit plants on the island of Java also in other areas such as Ambarawa, Magelang, Temanggung, Wonogiri in Central Java and Tumpang in East Java and also in Bantul Regency.

In Bantul Regency, there are farmers who have been planting longan since 2015. In 2017 there was 1 farmer group that planted a total of 160 longan plants, in 2018 there were 2 farmer groups that planted 60 and 300 longan plants respectively, while in 2019 there were 2 farmer groups that planted 500 and 30 longan plants respectively. The increase in the number of longan plants every year causes many longan plant pests to appear. This condition is known by the Bantul Regency Agricultural Extension Center so that the Agricultural Extension Center made a new program for longan farmers called the Integrated Pest Control Program, which was carried out in Murtigading Village, Sanden District, Bantul Regency.

In improving pest control for longan farmers, it can be done by providing skills in pest control, so that it will increase production and income. The government's efforts to improve the welfare of the people are currently being carried out more intensively, one of which is the Education and Training of the Integrated Pest Control Program [8]. Through the Integrated Pest Control Program activities, it is hoped that farmers will be better able to overcome their own problems, especially pest and disease control from an early age in the event of pest and disease attacks on their land. The Integrated Pest Control Program is expected to be able to transform farmers who were originally passive into creative, innovative and scientific. The Integrated Pest Control Program is a way to control plant growth in order to obtain maximum benefits [9]. The principles of the Integrated Pest Control Program are not just a message or a package of activities, but more in-depth. The Integrated Pest Control Program is a way to manage plant growth so that it can provide maximum profits. There are 4 managements: the basis of the program is flexible, adapted to the local area and land. The four principles are: 1) healthy plant cultivation: 2) preservation from natural enemies: 3) periodic monitoring: 4) expert farmers of the Integrated Pest Control Program.

Murtigading Village was chosen because there are farmers who grow longan in this location, but farmers in Murtiading Village still do not know how to control healthy pests without eradicating longan pests. Farmers use the old way, namely in their own way by using chemical pesticides. Murtigading Village is also the only village that is targeted by the Integrated Pest Control Program in Bantul Regency for longan plants.

Based on these problems, the formulation of the problem in this study is how the profile of longan farmers who participate in the integrated pest control program in Murtigading Village, how the response of longan farmers to the integrated pest control program is measured from attitudes and actions, and how is the relationship between the profile of longan farmers and the response in the form of attitudes and actions of longan farmers in Murtigading Village.

2 Research Method

The basic method used in this study is the descriptive method. The descriptive method is a method of researching the status of a group of people, an object, a condition, a system of thought, or a class of people in the present. Then the location selection was carried out purposively or deliberately, namely in Murtigading Village, Sanden District, Bantul Regency. The location was selected with the consideration that in Bantul Regency only the area runs a pest control program focusing on longan plants.

The respondents of this study are farmers in Murtigading Village, Sanden District, Bantul Regency who grow longan and participate in the Integrated Pest Control Program, namely farmers who are members of the Duta Makmur Farmers Group. Farmer respondents in the Duta Makmur longan farmer group were selected who participated in the integrated pest control program. The collection of respondents was carried out by the census method by giving questionnaires to all members of the Duta Makmur Farmers Group, namely 30 farmers.

The analysis techniques used include a descriptive method using scoring using Spearman Rank intervals. After knowing how the cognitive attitudes, affective attitudes, and actions of farmers towards the integrated pest control program are so that researchers know how farmers respond to the integrated pest control program in Murtigading Village, Sanden District. There are three variables used to measure farmers' responses: cognitive, affective, and behavioral.

2.1 Cognitive

There are seven indicators for this variable, each of which has a score (Table 1). And in total, it is also seen to describe the cognitive variables in their entirety (Table 2).

Table 1. Cognitive Indicator

No	Indicator	Score			
		Don't Know	**Know Enough**	**Know**	**Really Know**
1	Farmers' knowledge of longan plant pest organisms	1	2	3	4
2	Farmer's knowledge of the natural enemies of plant pest organisms	1	2	3	4
3	Farmer knowledge about compost	1	2	3	4
4	Farmers' knowledge about PGPR	1	2	3	4
5	Farmer knowledge about Beauveria Bassiana	1	2	3	4
6	Farmer knowledge about Tricoderma	1	2	3	4
7	Farmer's knowledge of control techniques Pests	1	2	3	4
Total		**7-28**			

Table 2. Cognitive Category

Score	Category
7 – 12.25	Don't Know
12.25 – 17.25	Know Enough
17.25 – 22.75	Know
22.75 – 28	Really Know

2.2 Affective

There are seven indicators for this variable, each of which has a score (Table 3). And in total, it is also seen to describe the affective variable in its entirety (Table 4).

Table 3. Affective Indicator

No	Indicator	Score			
		Don't Happy	**Happy Enough**	**Hap py**	**Really Happy**
1	Farmers on the observation of organisms	1	2	3	4
	Longan Plant Pests				
2	Farmers against compost	1	2	3	4
3	Farmers on the creation of PGPR	1	2	3	4
4	Farmers against the manufacture of Beauveria Bassiana	1	2	3	4
5	Farmers against the manufacture of Tricoderma	1	2	3	4
6	Farmers on pest control techniques	1	2	3	4
Total Score		**6-24**			

Table 4. Affective Score

Score	Category
6.0 – 10.5	Don't Happy
10.6 – 15.1	Happy enough
15.2 – 19.7	Happy
19.8 – 24	Really Happy

2.3 Conative

There are seven indicators for this variable, each of which has a score (Table 5). And in total it is also seen to describe the conative variable in its entirety (Table 6).

Table 5. Conative Indicator

No	Indicator	Score			
		No Act	**Little Act**	**Act**	**Lots of Atc**
1	Farmers observe organisms that interfere with longan plants	1	2	3	4
2	Farmers make compost	1	2	3	4
3	Farmers make PGPR	1	2	3	4
4	Farmers make Beauveria bassiana	1	2	3	4
5	Farmers make the manufacture of tricoderma	1	2	3	4
6	Farmers carry out pest control techniques	1	2	3	4
Total Score		**6-24**			

Furthermore, to be able to measure the relationship between motivation and internal and external factors, testing was carried out with the Spearman Rank Coefficient. The value that has been obtained is then interpreted by looking at the table below to find out the relationship between variables and find out the criteria (Table 7).

Table 6. Conative Category

Score	Conative
6.0 – 10.5	No Act
10.6 – 15.1	Little Act
15.2 – 19.7	Act
19.8 – 24	Lots of act

Table 7. Rank Spearman Correlation Interpretation

Correlation Coefficient Interval	Interpretation
0.00-0.199	Very Low
0.200-0.399	Low
0.400-0.599	Neutral
0.600-0.799	High
0.800-1.00	Very High

3 Results and Discussion

3.1 Farmers' Characteristic

3.1.1 Age

Age is the age of the respondents in years at the time of research located in Murtigading Village. Age needs to be known because it will determine the physical potential or related to how physically productive the respondent is in carrying out farming activities [10,11]. The following is the situation of respondents based on age level can be seen in table 8.

Table 8. Distribution of Respondents by Age Group

No	Age (Years)	Freq	Percent
1	40 – 49	8	26.67
2	50 – 59	9	30.00
3	60 – 69	8	26.67
4	70 – 79	5	16.67
Total		**30**	**100.00**

Based on Table 8, it can be seen that the age of farmers in Murtigading Village is evenly distributed, nothing conspicuous. The youngest longan farmer is 40 years old, and the oldest farmer is 77 years old. There are 13 farmers who are over 60 years old, while those under 60 years old are numbered. This shows that farmers who grow longan are still classified as productive in participating in the Integrated Pest Control Program, but for the age of 70 years and above, the intensity of participating in the Integrated Pest Control Program is lower in participating in the program.

3.1.2 Gender

Gender is a general description of the respondent's condition reviewed from the respondent's condition at the time of conducting the research [12–14]. The following is the state of respondents by gender, which can be seen in the table below.

Table 9. Distribution of respondents by gender group

No	Gender	Freq	Percent
1	Male	30	100
2	Female	0	0
	Total	**30**	**100**

Based on Table 12, it can be seen that the most dominant state of respondents based on gender in this study is 30 males with a percentage of 100%. As for the female respondents, none of them farmed longan.

3.1.3 Education Level

Education level is the level of education taken by respondents which is used to measure a person's intellectual level with the hope that the higher the level of education they have, the higher their intellectual level [15–17]. The following is the level of education taken by the respondents can be seen in the table below.

Table 10. Distribution of Respondents Based on Education Level

No	Education	Freq	Percent
1	Elementary School	2	6.67
2	Junior High School	2	6.67
3	Senior High School	18	60.00
4	S1	8	26.67
Total		**30**	**100.00**

Based on Table 10, it can be seen that the condition of the respondents based on the last level of education taken by the respondents in this study is dominated by the high school level, which is as many as 18 people with a percentage of 60%, for the last level of education taken by the next respondent is S1, which is as many as 8 people with a percentage of 26.27%. Meanwhile, the elementary and junior high school education levels taken by respondents were only 2 people each with a percentage of 6.67%. Based on these data, it can be seen that the education of respondents has a high level of education and will also affect their intellectual level.

3.1.4 Land

The land area is the area of land owned by respondents used for longan farming. The laha used is monoculture plant land or only longan plants without any other plants. The following is the land area based on land area ownership, which can be seen on the table below.

Table 11. Distribution of Respondents Based on Land Area Ownership

No	Land Size (m^2)	Freq	Percent
1	250 – 998	21	70
2	999-1.746	6	20
3	1.747- 2.494	2	7
4	> 2.495	1	3
Total		**30**	**100**
Average			**829 m^2**

Based on Table 14, it can be seen that the situation of respondents based on land area ownership varies greatly. The land area of 250-998 m^2 that is the most owned is 21 people with a percentage of 70%, for the next largest land area owned by respondents is between 999-1746 m^2 with a total of 6 people or a percentage of 20%. The land area is between 1747- 2494 m^2 with a population of 2 people with a percentage of 7%. Meanwhile, the most extensive land area is from a distance between > 2495 m^2 with a total of 1 person or a percentage of only 3%. The area of land can affect the level of income obtained by each farmer where the larger the land owned by the farmer, the higher the level of income each time production. The average land area owned by longan farmers in Murtigading village is 829 m^2.

3.1.5 Income

The respondent's income is obtained from the harvest seen from the number of stems and the selling price per kilo and will be the total income of longan farmers in one year.

Table 12. Distribution of Respondents Based on Annual Income

No	Income	Freq	Percent
1	IDR 8,400,000 - IDR 49,900,000	23	76.67
2	IDR 49,900,001 - IDR 91,400,000	5	16.67
3	IDR 91,400,001 – 132,900,000	1	3.33
4	> 132,900.000	1	3.33
Total		**30**	**100**
Average			**IDR 41,597,500**

Based on Table 12, it can be seen that the situation of the respondents based on the monthly income varies greatly, but the income dominated by the respondents at the time of the interview is between IDR 8,400,000 - IDR 49,900,000 per year, which is as many as 23 people with a percentage of 76.67%, for the next one, which is IDR. 49,900,001 - IDR 91,400,000 per year, which is as many as 5 people with a percentage of 16%. However, the income of respondents whose value is from IDR 91,400,001 - 132,900,000 per year is only 1 person with a percentage of 3.33%, while the income from > IDR. 132,900,000 per year is only 1 person with a total percentage of 3.33%. The income obtained by respondents from the harvest of longan farmers after calculating the average is IDR. 41,597,500 per year. How to plant longan farmers in the yard of a house that is specifically for longan fruits or monoculture.

3.2 Longan Farmers' Response to the Integrated Pest Control Program

3.2.1 Cognitive

The cognitive attitude in this case is how farmers actually understand the knowledge of the integrated pest control program. The understanding in question includes farmers' knowledge about longan pest and disease, farmers' knowledge about pest and disease natural enemies, farmers' knowledge about composting, farmers' knowledge about PGPR, farmers' knowledge about Beauveria bassiana, farmers' knowledge about tricoderma and farmers' knowledge about pest control techniques. The following is the response of farmers to the integrated pest control program can be seen in Table 13.

Table 13. Indicators of Longan Farmers' Cognitive Attitudes towards Integrated Pest Control Programs

No	Indicator	Average
1	Farmers' knowledge of longan plant pest organisms	3
2	Farmer's knowledge of the natural enemies of plant pest organisms	2.3
3	Farmer knowledge about composting	3
4	Farmers' knowledge about PGPR	2.6
5	Farmer knowledge about Beauveria bassiana	2.5
6	Farmer knowledge about tricoderma	2.6
7	Farmer's knowledge of pest control techniques	2.9
Total		**18.9 (Know)**

Based on the results of the score measurement in table 13, it is known that the cognitive attitude response to the Integrated Pest Control Program is included in the tofu category. The know category means that the farmer knows the name and time of the longan plant pest organisms attack, knows how to make compost, knows the types of biological agents PGPR, Beauveria Bassiana and Tricoderma, and also knows how to apply biological agents to longan plants but the farmer does not know about the natural enemies of longan plant pest organisms.

3.2.2 Affective

Affective attitude is a feeling that longan farmers have in giving an attitude in the form of a sense of pleasure towards the Integrated Pest Control Program. The feelings in question include how farmers' attitudes towards the observation of organisms that interfere with longan plants, farmers' attitudes towards the manufacture of compost, farmers' attitudes towards the manufacture of PGPR, farmers' attitudes towards the manufacture of Beauveria Bassiana, farmers' attitudes towards the manufacture of Tricoderma, and farmers' attitudes towards pest control techniques. The following is the response of longan farmers to the Integrated Pest Control Program can be seen in table below 14.

Table 14. Indicators of Affective Attitudes of Longan Farmers towards the Integrated Pest Control Program

No	Indicator	Average
1	Farmers on the observation of organisms Longan Plant Pests	2.3
2	Farmers against compost	3
3	Farmers on the creation of PGPR	2.6
4	Farmers against the manufacture of Beauveria Bassiana	2.5
5	Farmers against the manufacture of Tricoderma	2.6
6	Farmers on pest control techniques	2.9
Total Score		**14.8 (Happy Enough)**

Based on the results of the score measurement in table 14, it is known that the affective response to the Integrated Pest Control Program is included in the category of quite happy, because farmers do not carefully observe pests because many pests in longan plants are hidden. The category is quite happy, which means that the farmer is only happy to observe the pest and disease that attacks longan. But farmers do not like the manufacture of biological agents PGPR, Beauveria Bassiana, Tricoderma and compost making because the manufacture is relatively complicated.

3.2.3 Conative

The action in this case is that farmers carry out the Integrated Pest Control Program that has been provided by the Agricultural Extension Agency, in the form of farmers observing the orgnism of longan plant pests, farmers making compost, farmers making PGPR, farmers making Beauveria Bassiana, farmers making Tricoderma, and farmers carrying out pest control techniques can be seen on Table 15.

Based on the results of the score measurement in table 15, it is known that the action response to the integrated pest control program is included in the category of being carried out quite a lot. This is because the majority of longan farmers plant in their yards. In terms of making PGPR, Beauveria Bassiana, Tricoderma, compost and pest control techniques are only carried out as much as 4x out of a total of 6x manufacturing.

Table 15. Indicators of Longan Farmers' Actions towards the Integrated Pest Control Program

No	Indicator	Average
1	Farmers observe organisms that interfere with longan plants	3
2	Farmers make compost	2.8
3	Farmers make PGPR	2.5
4	Farmers make Beauveria bassiana	2.5
5	Farmers make the manufacture of tricoderma	2.4
6	Farmers carry out pest control techniques	3.1
Total		**14.8 (Quite Many)**

3.3 The Relationship Between Longan Farmer Profile and Longan Farmer Response in Murtigading Village

In this study, the relationship between farmer profiles and longan farmers' responses to the Integrated Pest Control Program includes age, education, land area and income. The value of the correlation coefficient between farmer profile and longan farmer's response to the integrated pest identification program can be seen in the table below.

Table 16. Spearman Rank Correlation Coefficient Value: Relationship between Longan Farmer Profile and Response

Factor	Correlation Coefficient (r)					
	Cognitive	Correlation	Affective	Correlation	Conative	Correlation
Age	-0.253	Low	-0.196	Very Low	-0.343	Low
Education	0.220	Low	-0.100	Very Low	0.018	Very Low
Land Size	0.502	Quite Meaningful	0.251	Low	0.326	Low
Income	0 618	Quite Meaningful	0.376	Low	0.518	Quite Meaningful

3.3.1 Age

Based on table 16, the correlation of age with cognitive attitudes towards the Integrated Pest Control Program is marked with rs = - 0.253. Age with cognitive attitudes has a low correlation with negative signs, meaning that young farmers have high knowledge of the Integrated Pest Control Program. The correlation between age and farmers' affective attitude towards the Integrated Pest Control Program was marked by rs= -0.196. Age with Affective attitudes have a low correlation with negative markings, which means that young farmers have a high sense of satisfaction with the Integrated Pest Control Program. The age correlation with farmers' actions towards the Integrated Pest Control Program is marked by rs= -0.343. Age with action has a low association with negative markers. This means that young farmers are doing more of the things recommended in the Integrated Pest Control Program.

3.3.2 Education

Based on table 16, the correlation of education with cognitive attitudes towards the pest control program is marked with rs = 0.22. Education with cognitive attitudes has a low relationship with positive signs. This means that highly educated farmers have extensive knowledge of integrated pest control programs. The correlation between education and farmers' affective attitudes towards the integrated pest control program was marked by rs= -0.1. Education with an affective attitude has a low correlation with a negative sign. This means that farmers with higher education are not happy with the programs provided by the Agricultural Extension Center. The correlation between education and farmers' actions towards the integrated pest control program is marked by rs= 0.018. Farmer education and action have a low relationship with positive signs. This means that highly educated farmers do what is recommended in the Integrated Pest Control Program.

3.3.3 Land

Based on table 16, the correlation of land area with cognitive attitudes towards pest control programs is marked with rs = 0.502. The area of land with cognitive attitudes has a sufficient relationship with positive signs. This means that farmers who have large longan land have high knowledge of the Integrated Pest Control Program. Farmers in Murtigading Village, which has a large land, also have a lot of long-term plants planted so that farmers will try to learn and understand what is in the Integrated Pest Control Program. The correlation of land area with farmers' affective attitude towards the integrated pest control program is marked by rs= 0.251. The area of land with an Affective attitude has a low relationship with positive signs. This means that farmers who have a large area of land are happy with the program provided by the Agricultural Extension Center. This is because the program can help control longan pests that are planted. The correlation of land area with farmers' actions towards the integrated pest control program is marked by rs= 0.326. The area of land owned by farmers with actions has a low relationship with positive signs. This means that farmers who have large areas of land tend to do what is recommended in the Integrated Pest Control Program.

3.3.4 Income

Based on table 16, the correlation of income with cognitive attitudes towards the pest control program marked with rs = 0.618 and marked positive. Income and cognitive attitudes have a strong correlation with positive signs. This means that farmers with high incomes have high knowledge about the Integrated Pest Control Program. The correlation of income with farmers' affective attitude towards the integrated pest control program is marked by rs= 0.376. Income with an Affective attitude has a low correlation with positive signs. This means that farmers with high incomes are happy with the program provided by the Agricultural Extension Center. This is because the program can help control longan pests that are planted. The correlation of income with farmers' actions towards the Integrated Pest Control Program is marked by rs= 0.518. The income that farmers have with their actions has a sufficient relationship, which means that it is a positive sign. This means that farmers who have high incomes tend to do what is recommended in the integrated pest control program.

4 Conclusion

The profile of longan farmers was found that the age of most farmers was 50 – 59 years old. The most dominant gender in this study was 30 males. The last level of education in this study is mostly dominated at the high school level. Meanwhile, the majority of the land area is owned by farmers of 250-998 m^2 and the income generated by farmers in one harvest per year is dominated by between IDR 8,400,000 - IDR 49,900,000 per year. The response of longan farmers to the Integrated Pest Control Program includes cognitive attitudes, affective attitudes and actions. The cognitive attitude response of longan farmers to the pest control program is included in the category of "Know" about the name and time of longan pest and disease attack, as well as how to make biological agents. The affective attitude response of longan farmers to the integrated pest control program is included in the category of "quite happy", meaning that out of the 6 aspects given, farmers only like the introduction of longan pest and disease. The response of longan farmers to the pest control program is included in the category of "Done enough". This means that only 4x of the total 6x of the manufacture of biological agents is done. The factors that correlate is quite significant, namely land area with cognitive attitudes, income with cognitive attitudes and income with actions. Meanwhile, the factors that are low correlated are the age factor with cognitive attitudes and affective attitudes, education with cognitive attitudes, land area with affective attitudes and actions, income with affective attitudes. Factors that correlate very low are age with affective attitudes, education with affective attitudes and actions. It is necessary to increase the frequency of counseling so that farmers' knowledge of integrated pest control programs increases. In addition, they provide brochures to farmers to read, and farmers are motivated and understood so that farmers do not think that the integrated pest control program is complicated, and the creation of biological agencies is carried out in a joint way.

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