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The Influence of Farmer's Attitudes in the Decision to Use Chemical Pesticides in the Protection of Horticultural Crop Cayenne Pepper (*Capsicum Frutescens* L.) in Bayan District, North Lombok Regency

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Abstract
Farmer's attitudes are the main factor in deciding to carry out something, including decisions regarding the use of pesticides in farming. The objectives of this research are (1) analyzing the influence of farmers' attitudes on decisions regarding the use of chemical pesticides in protecting cayenne pepper plants and (2) finding a model approach to reducing the use of chemical pesticides on cayenne pepper plants. This study uses descriptive methods and quantitative research types. The study uses a comparative type. The research location was in Bayan District as a center for the development of cayenne pepper in North Lombok Regency. Data analysis uses SEM (Structural Equation Model) with PLS (Partial Least Squares). The results of the research are: (1) The influence of farmers' attitudes, consisting of affective and conative, influences farmers' decisions in protecting cayenne pepper plants using chemical pesticides. Meanwhile, the cognitive aspect does not influence farmers' decisions. (2) The model that can be proposed is to reduce the use of chemical pesticides; it is necessary to maximize farmers' attitudes through socialization and training, especially those that can touch farmers' cognition (knowledge).

Keywords: *Attitude; Pesticides; Cayenne Pepper*

1. Introduction

Indonesia as an agricultural country produces high levels of agricultural products. Horticultural agricultural products are among the widely produced agricultural products in Indonesia. According to data from [1], the total production of horticultural products for 2023 is 14.60 million tons. There are many types of horticulture in Indonesia, one of which is the cultivation of cayenne pepper (*Capsicum frutescens* L.) The level of chili consumption is currently experiencing an increasing trend from year to year. For 2022, it is recorded that 960,000 tons of chili will be used for public consumption [2]. Cayenne pepper plants can grow in all regions in Indonesia. In addition, housewives often place cayenne pepper plants in front of their yards as an aesthetic element and a hobby, aiming to create a living garden and kitchen. Therefore, we can conclude that cayenne pepper is a plant that closely resembles human life and is essential to every household's kitchen. In addition to its use as a cooking spice, post-harvest processing enables this plant to function as an agribusiness product. One of them is that it can be processed into long-lasting sauce or chili sauce. So in the future, the prospects for the cayenne pepper business will be quite bright, in addition to increasing population growth plus high community mobility so that the need for fast, uncomplicated, and long-lasting food will become an option.

West Nusa Tenggara Province is renowned for its high production of cayenne pepper. According to data from the Central Statistics Agency in 2023, cayenne pepper production in West Nusa Tenggara Province reached 679,631 quintals or around 67 thousand tons per year 2023. This data explains that West Nusa Tenggara Province contributed approximately 10% of the nation's total cayenne pepper production. North Lombok Regency is one of the Cayenne pepper-producing

districts. The total production of cayenne pepper in North Lombok Regency in 2023 will be 2,587.6 tons [3]. The highest production was in Bayan District, namely 1,938.6 tons [4]. With the high public interest in cultivating cayenne pepper plants, this will of course be correlated with the use of chemical pesticides on agricultural land cultivated for farming. The use of chemical pesticides has now become a factor in the success of farming. Farmers' behavior in using chemical pesticides massively increases the risk of declining health, decreasing soil and water quality and the environment [5]. According to [5], farmers' attitudes and behavior in using pesticides must comply with applicable regulations. If farmers' attitudes and behavior are good in using pesticides, then the impact on the environment and health will also be good, and conversely, if farmers' attitudes and behavior are not good in using pesticides, then the impact on the environment and health will also not be good.

Farmers' attitudes are the main factor in deciding to carry out something, including decisions regarding the use of pesticides in farming. According to [6] posits that an individual's attitude is an evaluative response that emerges only when they encounter a desired stimulus. In this case, the stimulus that comes to farmers is a stimulus to increase the production of cayenne pepper by minimizing pest disturbances to the chili plants being cultivated. Attitude itself has 3 (three) aspects, namely cognitive aspects, affective aspects, and conative aspects. The objectives of this research are: (1) to analyze the influence of farmers' attitudes on decisions regarding the use of chemical pesticides in protecting cayenne pepper plants, and (2) to find a model approach to reducing the use of chemical pesticides on cayenne pepper plants. The benefits of this research are: (1) Providing input to policyholders to be able to formulate policies in the agricultural sector that are more directed towards environmentally friendly concepts. (2) The research also serves as a valuable reference for other researchers pursuing similar research in the field of sustainable agriculture.

2. Materials and Methods

This study uses descriptive methods and quantitative research types. The study employed a comparative approach, utilizing questionnaires to gather data from respondents. According to [7] states that comparative studies are a type of descriptive research that aims to answer fundamentally about cause and effect by looking at how certain events or phenomena occur. SEM (Structural Equation Model) analysis with PLS (Partial Least Square) will be used to analyze the data. The data will be quantitative. This will ultimately provide a comprehensive understanding of how farmers' attitudes influence their decision to use chemical pesticides in Bayan District, North Lombok Regency.

Initial data comes from direct interviews with farmers who cultivate cayenne pepper (*Capsicum frutescens* L.). Secondary data is sourced from reports and archives from the institutions involved in this research. We used the interview method of asking questions to collect primary data. We use the following Slovin formula to determine the sample size:

$$n = \frac{N}{1 + N(e)^2}$$

With :
n = number of samples
N = total population.
e = error level (5%)
Therefore, the sample size is calculated as follows:
With the population of cayenne pepper farmers in Bayan District being 223 farmers, the sample obtained based on the Slovin formula is as follows:

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$$n = \frac{223}{1+ 223(0,05)^2}$$

$$= \frac{223}{1+ 0,557}$$

$$= \frac{223}{1,557} = 143$$

Table 1 below provides more information about selecting the sample at each research location:

Table 1. Lists the number of samples according to the research location

No	Name of Village	Amount of Respondent
1	Akar-akar	12
2	Anyar	12
3	Bayan	12
4	Karang Bajo	12
5	Loloan	12
6	Mumbul Sari	12
7	Sambik Elen	12
8	Senaru	11
9	Sukadana	12
10	Gunjan Asri	12
11	Andalan	12
12	Batu Rakit	12
Total		**143**

Source: Processed Primary Data

In this research, there are several variables, including the dependent variable, namely the farmer's decision to use chemical pesticides (Y), and the independent variable, namely the farmer's attitude which consists of Cognitive (X1), Affective (X2) and Conation (X3). For data analysis using Structural Equation Modeling (SEM) techniques with Partial Least Squares (PLS) analysis. According to [8], it is a multivariate statistical technique that compares multiple dependent variables and multiple independent variables using the SEMPLS Version 4 application. A Likert scale measures the weighting of respondents' answers. With the categories strongly agree point 5, agree point 4, disagree point 3, disagree point 2, strongly disagree get point 1.

The hypotheses in this research are:

1. Ho: $\rho = 0$ (There is no influence between farmers' cognitive abilities on the decision to use chemical pesticides to protect cayenne pepper plants)

   Ha: $\rho \neq 0$ (There is an influence between farmers' cognitive abilities on the decision to use chemical pesticides to protect cayenne pepper plants)

2. Ho: $\rho = 0$ (There is no influence between farmers' affectivity on the decision to use chemical pesticides to protect cayenne pepper plants)

   Ha: $\rho \neq 0$ (There is an influence between farmers' affective influence on the decision to use chemical pesticides to protect cayenne pepper plants)

3. Ho: $\rho = 0$ (There is no influence between farmers' conation on the decision to use chemical pesticides to protect cayenne pepper plants)

   Ha: $\rho \neq 0$ (There is no influence between farmers' conation on the decision to use chemical pesticides to protect cayenne pepper plants)

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Figure 1 below presents the research's conceptual framework:

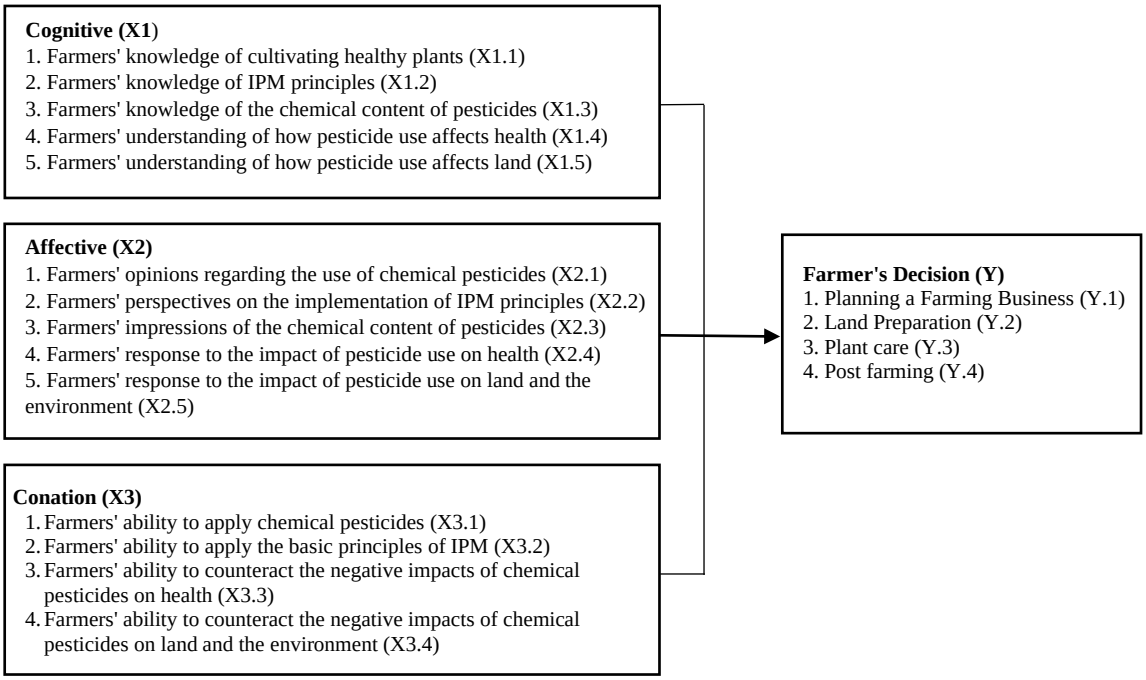

Figure 1. Research Thinking Framework

3. Results and Discussion

3.1 General Conditions of the Research Area

Administratively, Bayan District consists of 12 (twelve) villages. Research locations were carried out in all villages in Bayan District. The topographic condition of the research area is that there are low and highlands. In the Bayan District itself, there is a group of mountains that stretches from the winning subdistrict to the Bayan subdistrict. In general, the Bayan sub-district is dry land, apart from there are several villages located in the highlands, such as Senaru Village and Gunjan Asri Village. Other locations are in the lowlands. Of course, this will affect the type of commodity cultivated. In this research, the focus will be on cayenne pepper (*Capsicum frutescens* L.).

3.2 Data Analysis Results

This research uses Structural Equation Modeling Partial Least Square (SEMPLS) analysis which was carried out using the partial least squares method in the context of structural equation modeling to determine the influence of farmers' attitudes (Cognitive, Affective, and Conation) on farmers' decisions in using chemical pesticides to protect chili plants. Cultivated cayenne (*Capsicum frutescens* L.). In analyzing data, especially when using SEM analysis, 2 (two) types of analysis are needed, namely outer model and inner model evaluation.

3.3 Evaluation of the Outer Model or Measurement Model

In the Outer evaluation, this measurement model is used to evaluate construct validity and to verify its validity (instrument reliability). We use validity testing to assess the instrument's data-gathering capabilities, enabling accurate measurements of farmers' variable attitudes and their indicators in this research. Reliability testing is carried out to measure the consistency or constancy of measuring instruments in measuring research indicators using guided questions (questionary). We conducted calculations using the SmartPLS 4 application and obtained the following results:

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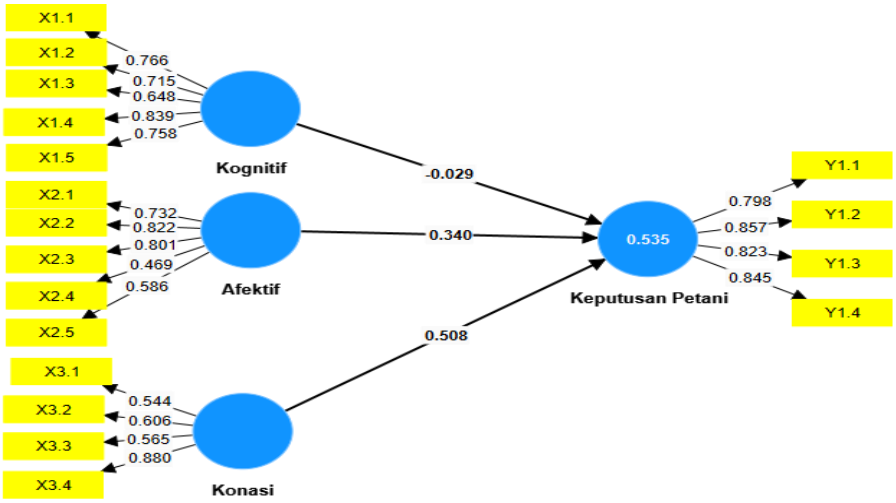

Figure 2. Research Measurement Model and Loading Factor Value

In Figure 3, it can be seen that all loading factor values are above 0.50, except for the indicator on the affective aspect with code X2.4. The factor loading result is 0.469 (below 0.5). According to [8] states that if a construct's loading factor value exceeds 0.50 (>0.50), it is considered significant. Therefore, we need to remove these indicators from the measurement model. The following are the results of the factor loading values after removing the X2.4 indicator.

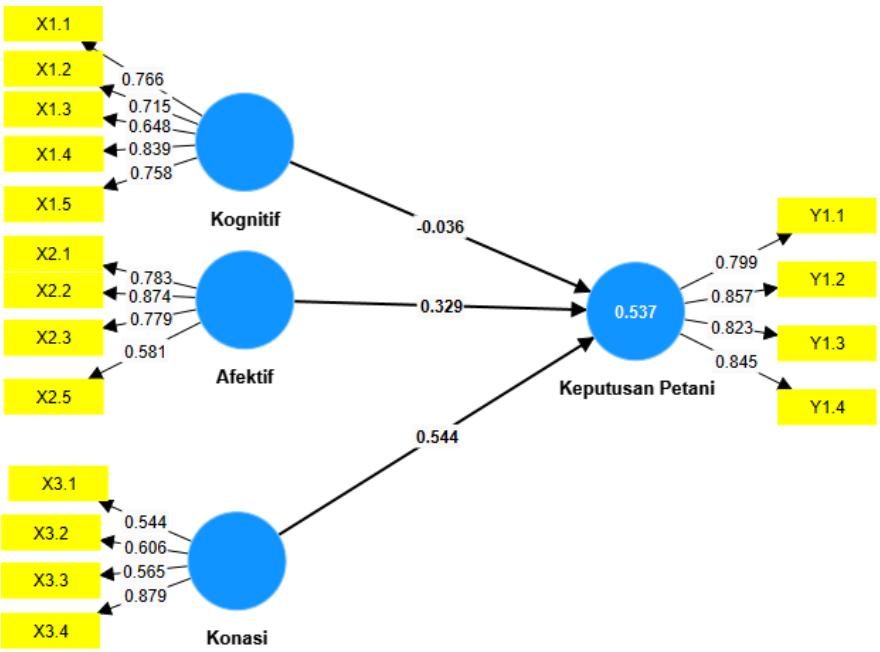

Figure 3. Research Measurement Model and Loading Factor Value after Removing the X2.4 Value

We can say that the model has good convergent validity after carrying out revisions. The initial stage is to determine the outer loading value of each indicator on the construct. Table 2 below presents the results of the loading factor calculation in more detail:

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Tabel 2. Nilai *Outer Loading*

	Cognitive	Affective	Conation	Farmer's decision
X1.1	0.766			
X1.2	0.715			
X1.3	0.648			
X1.4	0.839			
X1.5	0.758			
X2.1		0.783		
X2.2		0.874		
X2.3		0.779		
X2.5		0.581		
X3.1			0.544	
X3.2			0.606	
X3.3			0.565	
X3.4			0.879	
Y1.1				0.799
Y1.2				0.857
Y1.3				0.823
Y1.4				0.845

Source: Processed Primary Data

From Table 2, the obtained outer loading values for all question items are above 0.6, following the rule of thumb for convergent and discriminant validity tests as well as the opinion of [9]. Especially for confirmatory research, the loading factor value must be more than 0.7. Therefore, we can conclude that all the indicators comprising the variables or outer model in this research exhibit high validity, also known as convergent validity.

Next, to find out whether the model meets the requirements for discriminant validity, it is necessary to test it with the same application, namely SmartPLS 4. Following are the results of calculating discriminant validity. Upon testing discriminant validity, we observe that the root value of AVE (Average Variance Extracted) surpasses the correlation value between the indicator and other constructs. Table 3 below will provide further details.

Table 3. Value of *Fornell – lacker criterion*

	Affective	Farmer's Decision	Cognitive	Conation
Affective	0.762			
Farmer's Decision	0.558	0.831		
Cognitive	0.731	0.473	0.748	
Conation	0.469	0.681	0.493	0.663

Source: Processed Primary Data

According to [9] states that a model possesses good discriminant validity if the AVE (Average Variance Extracted) value exceeds the correlation value between the indicator and other constructs. From Table 3 it can be seen that the resulting values meet the requirements to achieve good discriminant validity.

3.4 Reliability Test

Measuring the model's reliability (consistency) allows for evaluation. According to [10] stated that Cronbach's alpha value exceeds 0.60, it can be said that the model has good reliability. Hamid and Anwar state that a composite reliability value exceeding 0.70 indicates good reliability. The Cronbach's alpha value measures the lower limit of the reliability value of a construct and

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Composite reliability is useful for measuring the real value of the reliability of a construct. In the results of calculations using the SmartPLS 4 application in this study, all values for both Cronbach's alpha and Composite reliability were above the required values. Table 4 below provides further details.

Table 4. Cronbach's alpha and Composite reliability Value

	Cronbach's alpha	Composite reliability (rho_c)
Affective	0.756	0.844
Farmer's Decision	0.853	0.899
Cognitive	0.803	0.863
Conation	0.647	0.75

Source: Processed Primary Data

3.5 Inner Model

The purpose of the inner structural model test is to assess the structural model and forecast causal relationships among latent variables. This test uses the R squared (R2) value to calculate the level of variation in changes in the independent variable toward the dependent variable, as well as the path coefficient value or t-statistic value for each path. Table 5 below presents the R Square (R^2) value for this research, facilitating understanding:

Table 5. R Square (R^2) value

	R-square	R-square adjusted
Farmer's Decision	0.537	0.527

Source: Processed Primary Data

In Table 5, the R Square value of the farmer's decision variable is 0.537, meaning that the cognitive, affective, and conative variables can explain the farmer's decision variable by 53.7% and according to the rule of thumb of the R Square assessment standard, the value of 0.537 is included in the moderate category [9]. Figure 4 illustrates the detailed model of calculation results from the SmartPLS 4 application.

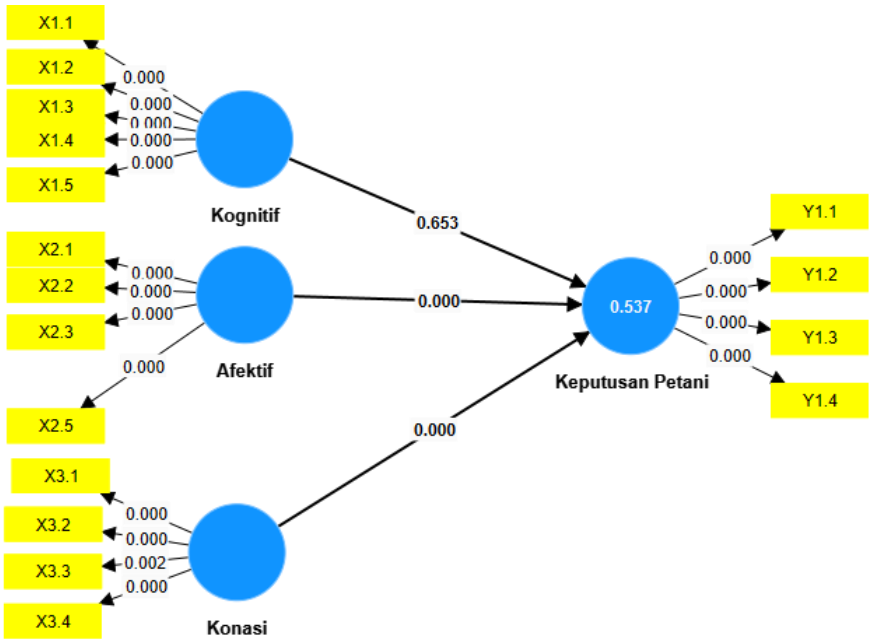

Figure 4. Structural Model Related to Inner Model

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The next step is to look at the influence of each independent variable on the dependent variable by paying attention to the obtained Effect Size value, as shown below in Table 6:

Table 6. Effect Size (f^2) Value

	Affective	Farmer's Decision	Cognitive	Conation
Affective		0.105		
Farmer's Decision				
Cognitive		0.001		
Conation		0.468		

Source: Processed Primary Data

In Table 6, the F Square value is under the role of thumb table for F-Square measurement based on the opinion of [11]. The affective variable exerts a moderate influence on the Farmer Decision variable, with a score of 0.105. Meanwhile, the influence of farmers' cognition on their decisions to use chemical pesticides is 0.001, falling into the weak category. The influence of conviction on farmers' decisions is 0.468, indicating a strong influence.

3.6 Significance test (Hypothesis Test)

After testing convergent validity, discriminant validity, and reliability, significance testing was then carried out on the research hypothesis. The path coefficient or inner model value shows the significance level of hypothesis testing. In this research, the Bootstrapping method will be used to test significance. Table 6 presents the results of the hypothesis test using the Path Coefficient value.

Table 7. Path Coefficient Value

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Affective -> Farmer's Decision	0.329	0.327	0.065	**5.062**	0
Cognitive -> Farmer's Decision	-0.036	-0.021	0.079	**0.450**	0.653
Conation -> Farmer's Decision	0.544	0.55	0.067	**8.080**	0

Source: Processed Primary Data

In Table 6, the results of hypothesis testing are listed which contain several values, namely t-statistics, p-values, Original sample (O), Sample Mean (M), and Standard Deviation. The following are the results of the research hypothesis testing:

1. There is an influence of affective variables on farmers' decisions to use chemical pesticides to protect cayenne pepper plants. With the explanation of the t-statistic value of 5.062 which is greater than 1.96 (margin of error 5%). And the p-values are 0, smaller than 0.05. The decision is Ha accepted.
2. There is no influence of farmers' cognitive variables on their decisions to use chemical pesticides to protect cayenne pepper plants. With the explanation that the t-statistical value is 0.450 which is smaller than 1.96 (margin of error 5%). And the p-value is 0.653 which is greater than 0.05. We reject Ha's proposal.
3. Farmers' decisions to use chemical pesticides to protect cayenne pepper plants are influenced by the correlation variable. With the explanation of the t-statistic value of 8.080 which is greater than 1.96 (margin of error 5%). And the p-values are 0, smaller than 0.05. The decision is Ha accepted.

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4. Conclusion

From the research findings, several conclusions can be drawn, including: (1) The influence of farmers' attitudes, consisting of affective and conative, influences farmers' decisions in protecting cayenne pepper plants using chemical pesticides. Meanwhile, the cognitive aspect does not influence farmers' decisions. (2) The model that can be proposed is to reduce the use of chemical pesticides, it is necessary to maximize farmers' attitudes through socialization and training, especially those that can touch farmers' cognition (knowledge). In the meantime, policymakers have the opportunity to enhance farmers' understanding of the risks associated with chemical pesticides for their health and the environment. So it can help accelerate the realization of sustainable agriculture. (2) for future researchers to deepen aspects related to farmers' attitudes in carrying out farming so that it can help stakeholders formulate better programs.

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