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The Behavior of Shallot Farmer Using Pesticides in Lembah Gumanti District, Solok Regency, Indonesia

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***Abstract*— Shallot plants in the horticultural plant require fertilizers and pesticides to grow and develop. This research focuses on the factors that influence the behavior of shallot farmers in the use of pesticides using the approach of predisposition, enabling, and reinforcing factors. This research was conducted using a quantitative descriptive approach in Lembah Gumanti, Alahan Panjang Subdistrict, Solok Regency, West Sumatra. The selection of Solok Regency was carried out purposively because Solok is the largest shallot production area in West Sumatra. Data were analyzed using Partial Least Square structural equation modeling. This research showed that (1) dispositioning factor do not have a significant effect on the behavior of shallot farmers in using pesticides; (2) enabling factor has a significant effect on the behavior of shallot farmers in using pesticides; (3) reinforcing factors have a significant effect on the behavior of shallot farmers in using pesticides; (4) Disposing of factors has a significant effect on the intention of shallot farmers in using pesticides; (5) intention has a significant effect on the behavior of shallot farmers in using pesticides. Thus, our study discovered that dispositioning traits have no obvious effect on the pesticide use behavior of shallot producers. However, enabling, reinforcing, and disposal variables and intention all have a significant effect on shallot producers' pesticide use. Further research is recommended using the interview to obtain comprehensive results regarding the dispositioning factors that do not significantly affect the behavior of shallot farmers in using pesticides.**

***Keywords*— Behaviour; enabling; farmers; predisposition; reinforcing; shallot.**

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I. INTRODUCTION

Shallot plants in the horticultural plant require fertilizers and pesticides to grow and develop [1], [2]. Pesticide is the main choice for controlling pests, diseases, and weeds because of its capability to kill the corpses directly [3], [4]. Controlling plant-disturbing organisms requires much time, effort, and costs [5], [6]. Pesticide efficacy is reliable, easy to use, has a high success rate, sufficient availability and easy to obtain, and relatively low cost [7], [8]. The benefits of pesticides are indeed proven to be large, affecting the behavior of farmers in conducting farming [9], [10]. Farmers become dependent on pesticides because pesticides are a determining factor for high production yields and product quality [11], [12], as reflected in every package of programs or agricultural activities that always include pesticides as part of production inputs [5], [13].

Based on the National Socio-Economic Survey (SUSENAS) results in 2006-2014, the consumption of shallots for the household fluctuated up and down with an average value of 2.51 kg/capita/year. The national need of the Indonesian people for shallots in 2014 was 627.2 thousand tons/year. Alahan Panjang is the center of shallots production in Solok Regency that contributes to producing shallots up to 95 % of the West Sumatra total production with a land area and production, respectively, 6,611 Ha 71,4562 Ton [14].

The use of pesticides intensively causes health problems [15], [16] such as poisoning [17], [18]. Farmers' awareness to protect themselves from the dangers of using pesticides is still lacking [19], [20]. Pesticides negatively impact consumers and the environment [21], [22]. Law No. 12 of 1992 about Plant Cultivation Systems, article 20 paragraph 1, that pesticides as a pest control system is the last alternative [23].

Many factors that influence the behavior of farmers in the use of pesticides need to be considered. Many negative effects that occur due to the use of pesticides that are not as recommended [24]–[26]. Behavioral factor aims to encourage behavioral changes in each individual [27], [28]. This study uses a combination of 2 theories of behavioral factors that become a reference in the study of farmer behavior in the use

of pesticides. The theory used is the theory of behavior change from Lawrence Green [27] and the theory of behavior intention from Ajzen [29]. This theory is divided into three main factors: Predisposing Factors (triggering or antecedents factors), namely behavioral factors that provide reasons or motivation for the behavior. Enabling Factors are behavioral factors that enable motivation to be carried out, and Reinforcing factors contribute to encouraging or strengthening the implementation of these behaviors.

II. Materials and Method

This research was classified as descriptive and associative research. Descriptive research aimed to describe or explain. Associative research aimed to see the relationship between independent variables. This research was an expo facto that is research that is to find out what causes something to happen and sort back so that the factors are known to cause.

The population of this research were shallot farmers in Lembah Gumanti Alahan Panjang Subdistrict in Solok Regency, West Sumatra Province, which consists of four Nagari, Nagari Alahan Panjang, Sungai Nanam, Salimpat and Air Dingin. Samples were taken randomly with a sample size of 150 people, with the following requirements: (1) shallot farmers (farmers who have the land to cultivate shallot) as members of the farming group; (2) farmers who do not join the farming group.

Data were analyzed based on the farmers' perceptions result of four variables (Table. 1): Predeposition Factor, Enabling Factor, Reinforcing Factor, and Intention. Data were analyzed using the PLS Structural Equation Model (SEM) analysis tool. SEM is a multivariate data analysis method used to test hypotheses on the relationships between observed and latent variables. There are two approaches used in SEM, one of which is Partial Least Squares SEM (PLS-SEM) [30]–[32]. The data were processed using the PLS-SEM method [33]. The PLS model consists of the following components [34]:

1) Creating A Structural Model (Inner Model): The structural model is a component that measures the relationship between latent variables or variables that are difficult to measure (endogenous and exogenous variables).

2) Creating a measurement model (outer model); The measurement model is a component that measures how the indicator variable represents the latent variable. There are two models for measuring latent variables in PLS-SEM: the reflective and formative models. So, there are two types of evaluation of the outer model: the evaluation of the reflective and formative models.

3) Determine the indicator measurement scale; The measurement scale determines whether each indicator connected to the latent variable is a formative or reflective indicator. Formative indicators cause latent variables, define latent variables, and cannot be exchanged between one another—the arrow direction of the formative indicator points towards the latent variable. Meanwhile, reflective indicators are mutually correlated indicators and can be exchanged. Latent variables cause reflective indicators. The latent variable is the outcome, translated into or observed from the reflective indicator. The direction of this indicator arrow is towards the indicator of the latent variable or the opposite of the direction of the formative indicator arrow. In this study, all indicators used are reflective indicators.

4) Path Model Construction (Path Diagram): The path model is a model that represents the structural model (inner model) and measurement model (outer model) that has been previously constructed and the direction of the arrows that have been determined. The path model in this study is a combination of special models to analyze factors that affect marketing efficiency in achieving performance marketing (Fig. 1).

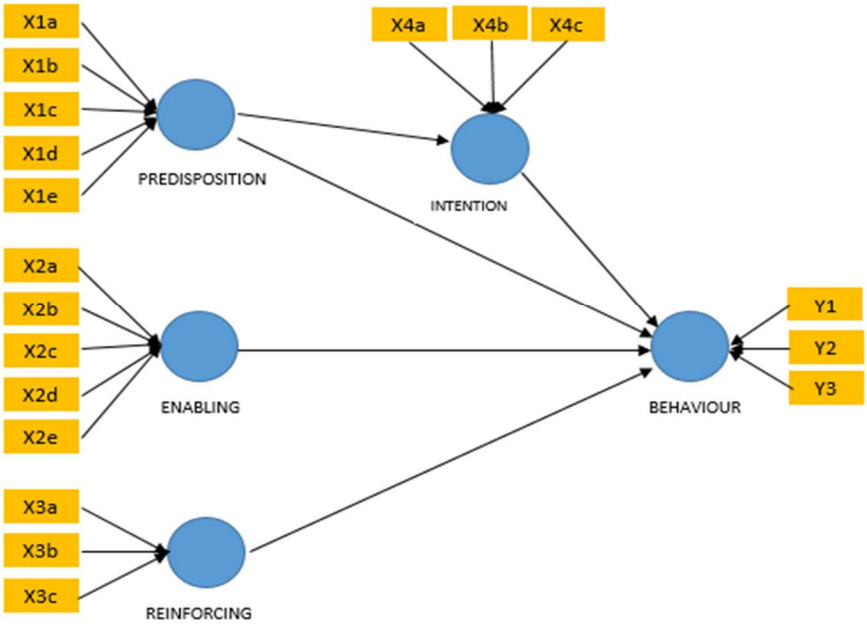

Fig. 1 Path diagram

TABLE I
RESEARCH VARIABLES

Variable Laten	Variabel manifest/indicators	Symbol
Predisposition Factors	Knowledge	X1a
	Attitude	X1b
	Trust	X1c
	Values	X1d
	Motivation	X1e
Enabling Factors	Environmental Facilities Training	X2a
	Work Safety / Personal Protective Equipment (PPE)	X2b
		X2c
	Affordability (price, distance, and transportation)	X2d
Reinforcing Factors	Social Support	X3a
	Constitution	X3b
	Supervision	X3c
Behaviors Intentions	Attitude	X4a
	Subjective Norms	X4b
	Behaviour	X4c
Behaviours	Cognitive	Y1
	Affective	Y2
	Psychomotor	Y3

5) Assessor checks the PLS output (result): There are two stages of the PLS model evaluation: evaluation of the outer model and evaluation of the inner model. In assessing the PLS output, it is necessary to consider whether the indicator is formative or reflective. This is because assessing the PLS output is different for each type of indicator. Furthermore, the evaluation stage of the PLS model and the output begins with testing the validity and reliability.

The validity test in this study used confirmatory analysis techniques (confirmatory factor analysis). The confirmatory analysis tests whether the indicators forming a construct are valid indicators as a latent construct measurement. The indicator can be valid if, first, the indicator is statistically significant. Second, each indicator's convergent validity or loading factor value is 0.5, which is considered to have good validity for a study, but the loading factor of 0.5 - 0.6 is still acceptable for early-stage research [32].

Before testing the hypothesis, it is necessary to test the feasibility of the data by measuring the validity and reliability of the observed variables. PL-SEM model in research uses formative indicators. In contrast to testing the outer model (measurement model) on models with reflective indicators, testing the outer model on formative indicators is carried out by different tests. There are two tests on formative indicators in measuring the SEM outer model, namely the significance of weights and multicollinearity [35].

The weight value of the formative indicator with its construction must be significant where the T statistical value must be greater than the T table at $\alpha = 5\%$ (1.96). The multicollinearity test was carried out to determine the relationship between indicators. Also, it is subject to finding out whether the formative indicators experience multicollinearity by looking at the VIF value. A VIF value of less than ten can be said that the indicator has no multicollinearity or correlation between indicators [35].

The coefficient of determination can measure how much variation in the latent dependent variable is explained by the independent latent variable [35]. The R-square value is the result (in the form of a percentage) of the representation of the independent variable on the dependent variable. A good R2 value is above 0.2 (equivalent to 20%).

III. RESULTS AND DISCUSSION

A. Confirmatory Factor Analysis

Based on the confirmatory factor analysis results of the predisposition variable in Figures 2, 3, 4, and 5, the indicators of predisposition, enabling, reinforcing, and intention have met the criteria for convergent validity (loading factor value > 0.5). Figure 2 confirms that the Predisposition variable is proven to be formed by five dimensions, namely the dimensions of knowledge, attitudes, beliefs, values, and motivation. Figure 3 confirms that the Enabling variable is proven to be formed by five dimensions, namely environmental facilities, training, PPE, affordability, and socio-economy. Figure 4 confirms that the Reinforcing variable is proven to be formed by three dimensions: social support, legislation, and supervision. Figure 5 confirms that the intention variable is proven to be formed by three dimensions, namely subjective norms, behavioral control, and attitudes.

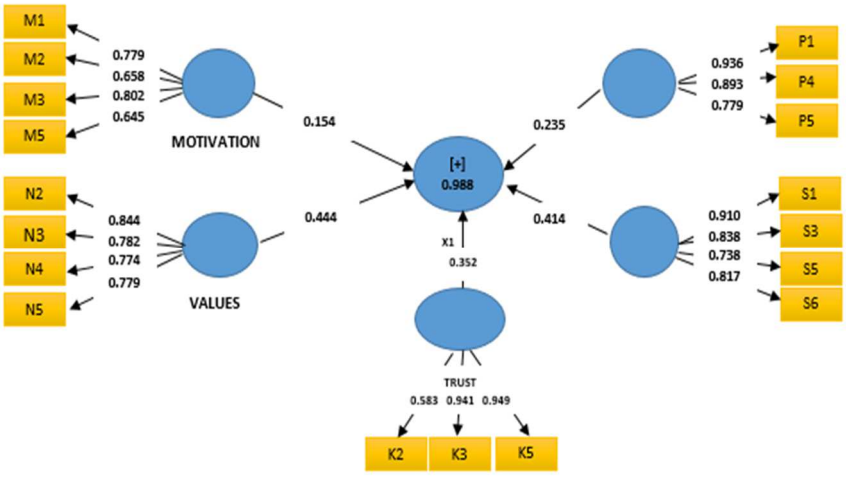

Fig. 2 CFA Variabel Predisposition

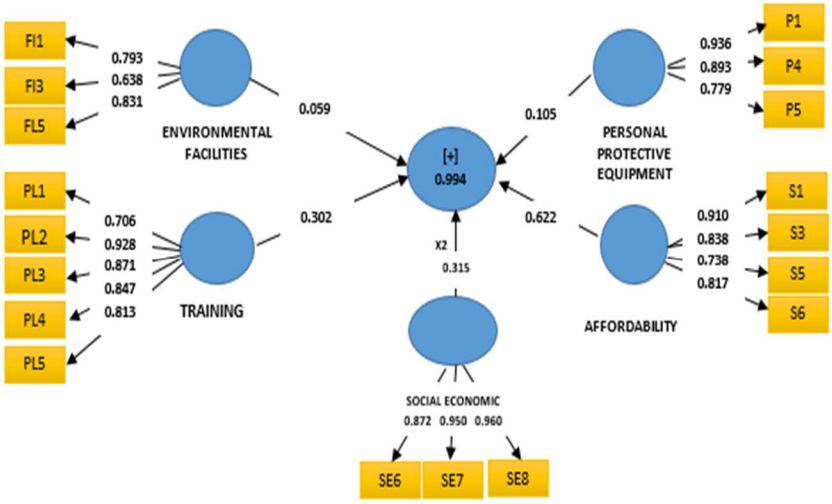

Fig. 3 CFA Variabel Enabling.

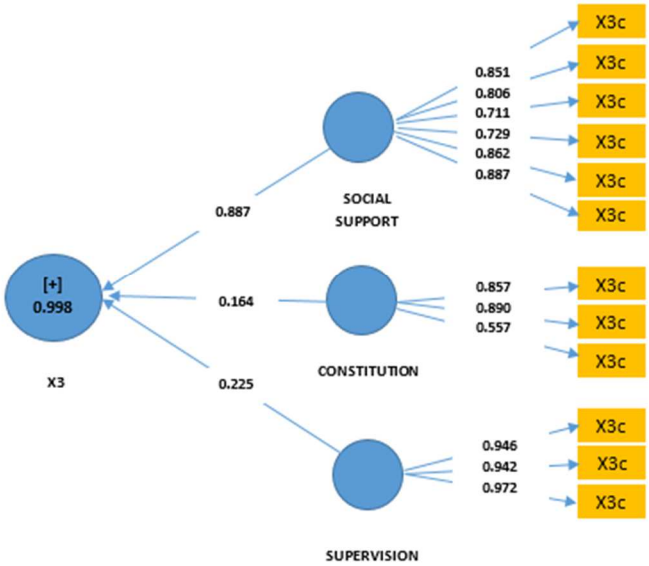

Fig. 4 Cfa variabel reinforcing.

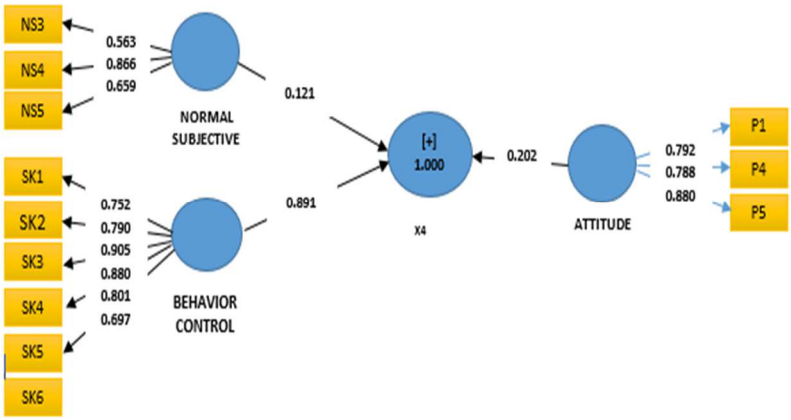

Fig. 5 CFA variable intention

B. Outer Analysis of Formative PLS-SEM Model

The weight value of the formative indicator with its construction must be significant where the T statistical value must be greater than the T table at α = 10% (1.96). The results of the significance of the weights test are presented in table 2.

TABLE II
THE RESULTS OF THE SIGNIFICANCE OF THE WEIGHTS TEST

Path	T Statistics (|O/STDEV|)	P Values
X1a -> Predisposition	3,198	0,043
X1b -> Predisposition	71,648	0,000
X1c -> Predisposition	5,857	0,014
X1e -> Predisposition	58,967	0,000
X2a -> Enabling	2,262	0,076
X2b -> Enabling	11,672	0,004
X2c -> Enabling	2,467	0,066
X2d -> Enabling	9,505	0,005
X2e -> Enabling	7,842	0,008
X3b -> Reinforcing	176,763	0,000
X3c -> Reinforcing	2,476	0,066
X4b -> Intention	7,301	0,009
X4c -> Intention	772,905	0,000
Y1 -> Behavior	15,013	0,002
Y2 -> Behavior	8,066	0,008
Y3 -> Behavior	3,076	0,046

The statistical T value presented in table 2 ranges from 2.476 to 772.905, meaning that all indicators have a statistical value greater than 1.96 or a significance value smaller than 0.05. These results indicate that all indicators have met the criteria for the significance of weights. Based on table 3, it is obtained that the VIF value of all indicators in the measurement model is smaller than 10. There is no correlation between the research indicators. Thus, the formative SEM model is analyzed further.

TABLE III
VIF RESULT

Indicators	VIF
X1a	1,061
X1b	1,062
X1c	1,019
X1e	1,038
X2a	1,077
X2b	1,614
X2c	1,609
X2d	2,090
X2e	2,287
X3b	1,008
X3c	1,008
X4b	1,056
X4c	1,056
Y1	2,054
Y2	2,002
Y3	1,076

C. Inner Model Analysis

The R-square value is the result (in the form of a percentage) of the representation of the independent variable on the dependent variable. The best R^2 value is above 0.2 (equivalent to 20%). The predisposing variable of 39.4% can explain the intention variable. The remaining 60.6% is explained by other variables which are not researched or included in this research model. The behavioral variable can be explained by the predisposing, enabling, reinforcing, and intention variables by 63%. The remaining 37% is explained by other variables which were not studied or included in this research model (Table 4 and 5).

TABLE IV
HYPOTHESIS TEST RESULTS FROM DIRECT EFFECT

	Original Sample (O)	Sample Mean	Standard Deviation	T Statistic (O)	P Values
Enabling -> Behavior	0.362	0.357	0.023	15.934	0.002
Intention -> Behavior	0.333	0.382	0.016	20.913	0.001
Predisposition -> Intention	0.628	0.603	0.009	67.503	0.000
Predisposition -> Behavior	0.084	0.059	0.099	0.848	0.243
Reinforcing -> Behavior	0.222	0.271	0.017	13.371	0.003

Based on table 4, obtained a significance value of 0.243> 0.10, a statistical T value of 0.848 <T table 1.96 so that it can be concluded that the first hypothesis is rejected or it can be said that the predisposition factor has no significant effect on the behavior of shallot farmers in using pesticides. Based on table 4, obtained that the significance value is 0.002 <0.10, the T statistical value is 15.934> T table 1.96 so that it can be concluded that the second hypothesis is accepted or it can be said that the enabling factors have a significant effect on the behavior of shallot farmers in the use of pesticides.

Based on table 4, obtained a significant value of 0.003 <0.10, the value of T statistic is 13.371> T table 1.96. It was concluded that the third hypothesis was accepted, or it could be said that the reinforcing factor had a significant effect on the behavior of shallot farmers in using pesticides. Based on table 4, obtained a significant value of 0.000 <0.10, the T statistic value is 67.503> T table 1.96 so that it can be concluded that the fourth hypothesis is accepted or it can be said that the predisposition factor has a significant effect on the intention of shallot farmers in using pesticides. Based on table 4, obtained a significant value of 0.001 <0.10, the value of T statistic is 20.913> T table 1.96 so that it can be concluded that the fifth hypothesis is accepted or it can be said that intention has a significant effect on the behavior of shallot farmers in the use of pesticides.

TABLE V
HYPOTHESIS TEST RESULTS INDIRECT EFFECT

	Original Sample (O)	Sample Mean	Standard Deviation	T Statistics (O)	P Values
Predisposition -> Intention -> Behavior	0.209	0.231	0.013	15.883	0.002

Based on table 5, obtained a significant value of 0.002 <0.10, a statistical T value of 15.883> T table 1.96 so that it can be concluded that the sixth hypothesis is accepted or it can be said that predisposition has a significant effect on the behavior of shallot farmers, behavior in using pesticides with intention as mediation.

IV. CONCLUSION

From the results of testing the hypothesis that has been carried out, it can be concluded as follows: Dispositioning factors do not significantly affect the behavior of shallot

farmers in using pesticides; Enabling factors have a significant effect on the behavior of shallot farmers in using pesticides; Reinforcing factors have a significant effect on the behavior of shallot farmers in using pesticides; Disposing of factors has a significant effect on the intention of shallot farmers in using pesticides; The intention has a significant effect on the behavior of shallot farmers in using pesticides.

Thus, this study found that dispositioning characteristics have no discernible effect on shallot producers' pesticide use behavior. However, enabling, reinforcing factors, disposal of elements, and intention considerably impact shallot producers' pesticide use. Further research using interviews is recommended to gather thorough results addressing the dispositional characteristics that do not substantially affect shallot growers' pesticide use behavior.

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