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ONION FARMERS BEHAVIOR IN ECOSYSTEM-BASED PEST (EBP) CONTROL IN SIGI DISTRICT OF CENTRAL SULAWESI PROVINCE

Kasman Jaya, Muhammad Ardi, Sylvia Sjam dan Gufran Darma Dirawan

This study aims to determine the direct effect of EBP knowledge, knowledge of pesticides, environmental knowledge and attitudes toward behavior farmers in ecosystem-based pest control plant in Sigi District. The type of study is a survey and ex-post facto correlational. The sample in this study is a farmer the village Olobojo Soulowe Biromaru in Sigi District and it was randomly selected 205 people onion farmers. Data were collected by questionnaire and analyzed by multivariate causal Eqution Structural Model (SEM). The research proves that the behavior of farmers in pest control respectively directly influenced positively by environmental knowledge and attitudes EBP. Moreover positive attitude of farmers directly affected by the EBP knowledge and knowledge of the environment. Farmer behavior in ecosystem-based pest control is not influenced indirectly by EBP knowledge, knowledge of pesticides and environmental knowledge through IPM attitude. These findings indicate that the variable environmental knowledge and attitude variables is the decisive factor in the controlling of farmers' behavior-based pest control or an integrated ecosystem. By increasing knowledge of farmers can increased onion farmer behavior in ecosystem-based pest control model without having to increase the IPM attitude first.

INTRODUCTION

Sustainable development of choice in preserving the planet from environmental degradation. Sustainable development according to Keraf (2010), is an ongoing process to optimize the benefits of natural resources and human resources, by harmonizing human activities in relation with the ability of natural resources to sustain it's self. Sustainable development strategy intends to develop harmony in between humankind and between humankind and nature. The alignment is not static or fixed, but is a dynamic process.

Relating to the concept of sustainable development in the agricultural sector, then the option to environmental sustainability in its broadest sense, including the health of producers and consumers and keep the interests of farmers need to be pursued and resolved, including the reduction of pesticide use in pest control that proved much harm for farmers and the environment. The dependence of farmers, especially onion farmers in Central Sulawesi in using pesticides in pest control is so broad and massive.

The fact shows that red onion yield losses due to pests and diseases or Plant Pest Organisms (OPT) can reach 50% even reported some areas of crop failure

Address for communication: **Kasman Jaya, Muhammad Ardi, dan Gufran Darma Dirawan,** Post Graduate Program, Makassar State University and **Sylvia Sjam,** Agriculture Faculty, Hasanuddin University of Makassar, *E-mail: kasmanjsaad@yahoo.co.id and gufrandarma@yahoo.com*

(BP4, 2014). A large enough yield loss caused onion farmers pest control relies on the use of pesticides (Kasman Jaya, 2011). Although, most of farmers believe pesticide is “god helper” in the event of pest attack. The use of pesticides is believed very powerful to overcome pests and diseases of plants (Suharjono, 2011; Uluwole, *et al.*, 2009, Luluk. S., *et al.*, 2008; Ameriana, 2008). According to Lucky (2006), the successful use of pesticides to protect crops from pest attacks in 1950 until 1960 give rise to optimism that the world community which has a pest problem can be solved completely. Demand and use of pesticides in agriculture increased very rapidly, so grow industries multinational giants dominate the world pesticide market. It encourages the public’s optimism implement agricultural intensification technology to increase food production, later known as the Green Revolution (Green Revolution).

These phenomena, especially those that occur in the onion farmers in the district Sigi, red onion production centers in Central Sulawesi province, not in spite of the lack of knowledge of Integrated Pest Management (IPM) and attitudes of the farmers that influenced their internal conflic between fulfilling the needs and constraints of business due to interference Great pests and orientation of onion farmers still limited production without considering the environmental safety aspects.

Role of onion farmers in Sigi district as the main actor in managing natural resources will determine the sustainability of agriculture in the future. Therefore, the behavior of farmers in pest and disease control based ecosystems needs to be improved.

One technique ecosystem-based pest control is to control the Integrated Pest Management (IPM). IPM is an approach / way of thinking/philosophy of pest control based on a consideration of the ecological and economic efficiency in the framework of the overall agro-ecosystem management. IPM concept is a concept or approach to pest control that is in principle different from conventional pest control concept which has been heavily dependent on pesticides. IPM is very in tune with the concept of sustainable agriculture, namely farming that meets present needs without negatively impacting on existing physical resources, so as not to endanger the capacity and future potential of agriculture to satisfy the material and environmental aspirations of future generations (Fortunately, 2006).

Based on the above-mentioned phenomenon, Robbins (2009), states that the factors that drive a person to behave caused by four aspects, namely their knowledge, perceptions, attitudes and values of an object. Someone behave or move because of the need for a purpose. Deslanie (2011) suggested that the formation and behavior change as a process of interaction between the individual and the environment through the learning process. Furthermore Sarwono (1992), suggests that changes in human behavior on the environment can be done gradually. In other words, humans can learners to be able to adjust to the environment. More continued Sarwono (1992) formulate behavior as a function of personal circumstances the person concerned (P = person) and the environment in which that person is (E = environment). Mathematically the relationship is shown as a function of B = f (P, E). From the function can be explained that the behavior is defined as the result of interaction between the stimulus and the response of all forms of complex behavior, including habits, thinking, and emotional reactions that formed the stimulus-specific responses that can be seen and measured.

Theory of planned behavior of Ajzen (theories of planned behavior) describes the behavioral changes that are planned and widely used in behavioral studies. According to Ajzen (1991), behavioral changes that can be planned. That the main factor that determines the formation of a behavior is the purpose of the behavior itself. Model behavior change raised by the Ajzen further explain that behavior change is determined by the attitudes (attitudes), knowledge (knowledge), the effect (self-efficacy), place (locus of control), and the purpose (intent). A behavior not formed just like that without any planning or awareness of one's going to the objectives to be achieved through such behavior.

Kollmus A. & Agyeman J. (2002), stating that environmental knowledge is a knowledge of a person so that he is able to manage natural resources wisely, able to prevent, analyze and mitigate the impact of the activity of thinking, acting and acts as a form of development on the environment. There is a linear relationship between knowledge, attitudes and behavior of the environment.

Based on the above it is to improve the behavior of onion farmers in pest control plant-based ecosystems need to examine the factors that influence it. The behavior of an ecosystem-based plant pest control is the behavior of farmers in pest control in accordance with the principles of IPM to suppress the negative effects of pesticide use and the expected quality of agricultural environment will also be better.

This study aims to determine whether there is a direct effect of IPM knowledge, knowledge of pesticides, environmental knowledge and attitude towards farmers' behavior in ecosystem-based pest control.

Research Methods

This study was conducted in villages Olobojo Soulowe Biromaru Sigi District of Central Sulawesi Province for six months, ie from September 2014 to March 2015. The goal of research is the onion farmers in the district Sigi.

The population in the study were farmers who cultivate shallots and onion and plant owners in Sigi. While the population are farmers in Olobojo and Soulowe village which is the center of onion in Sigi. The samples with 205 farmers choose the method of probability sample with a simple principle of proportional sampling, 205 samples of whole onion farmers.

Research using multivariate analysis of causal with Structural Equation Model (SEM). The variables that will be studied in this research are: IPM knowledge, knowledge of pesticides, environmental knowledge, attitudes and behavior in IPM IPM. The constellation of influences between these variables is described as follows:

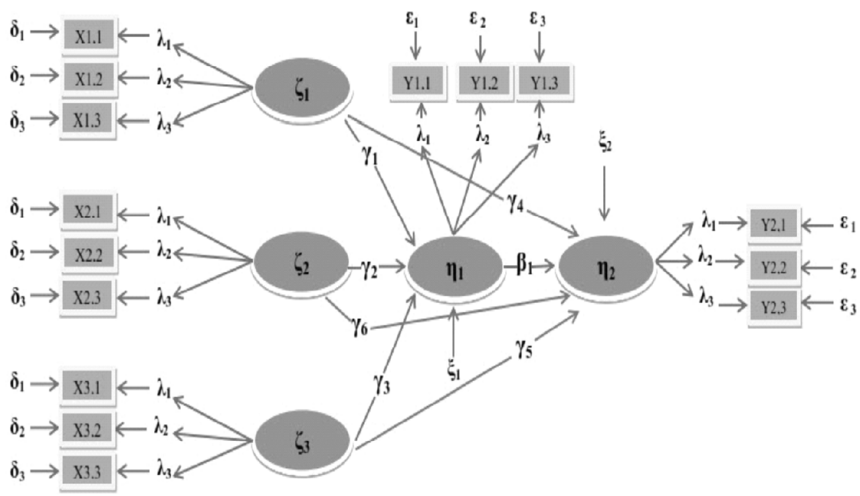

Figure 1: Constellation Research Issues

From the structure of the model, can be formulated mathematically as follows:

$$\eta_1 = \gamma_1 + \gamma_2 + \gamma_3 + \zeta_1 \quad (1)$$

$$\eta_2 = \gamma_4 + \gamma_5 + \gamma_6 + \beta_1 + \zeta_2 \quad (2)$$

Specification:

η_1 = endogen$_2$ variable (attitude in pest control (IPM))

η_2 = endogen$_2$ variable (behavior in ecosystem-based management (IPM)

ζ_1 = Variable exogen$_1$ (knowledge about IPM)

ζ_2 = Variable exogen$_2$ (knowledge about pesticides)

ζ_3 = Variable exogen$_3$ (knowledge about the environment)

γ = The magnitude of the effect of exogenous variables on endogenous variables

β = The magnitude of the effect of variable endogen$_1$ to endogen$_2$

ξ = error vector magnitude (error) in the structural relationships between variables

Technical analysis of data using descriptive analysis and inferential analysis. Descriptive analysis is used to present the data, the data size, the size of the central, as well as the size of the deployment. Inferential analysis was used to test the hypothesis by using a multivariate analysis of Structural Equation Model (SEM). Based on the model of the theoretical framework that has been built is transformed into the shape of the path diagram (path diagram) to describe the causality of constructs to be used. In this study, there are three variables / constructs exogenous (IPM knowledge, knowledge of pesticides, and environmental knowledge) and two variables / constructs endogenous (attitudes and behavior of farmers on IPM farmers in ecosystem-based pest control).

Counting in data analysis with regard to SEM in this study conducted with the help of a computer using AMOS program package 22.

Research Result

Based on SEM analysis model is used as a reference of this analysis is known, there are four positive direct effect, are as follows:

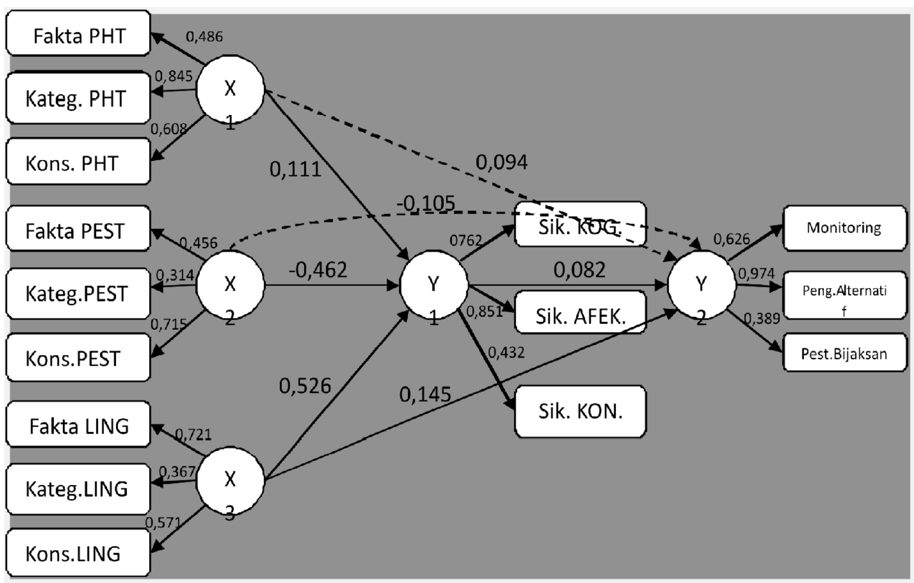

Figure 2: SEM Analysis Model Hypothesis Testing Results

Based on estimates SEM with 22 Amos path coefficients obtained knowledge of IPM (X1) on attitudes (Y1) in the integrated pest management obtained a value of 0.111. Results of the test statistic t (C, R) knowledge IPM positive influence on the behavior of farmers in IPM obtained value C, R of 2.032 and t table with a significance level of 5% and df = 80, or more than 29 is 1.645, for C, R> t table (2.032> 1.645), and the significance value less than 0.05 (p <0.05), thus there is a direct positive influence on the attitude of knowledge about IPM IPM. The contribution of a given variable X1 to Y1 (0.111) 2 x 100 = 1.23%. Factor constructs knowledge about the environmental category contributed the dominant (.845) against environmental knowledge.

SEM estimation results with 22 Amos path coefficients obtained knowledge of the environment (X3) on attitudes in integrated pest management (Y1) obtained a value of 0.526. Results of the test statistic t (C, R) direct effect positive environmental knowledge on the attitudes of farmers obtained value C, R of 2.634 and t table with a significance level of 5% and more than 29 df is 1.645, for C, R> t table (2.441 > 1.645), and the significance value less than 0.05 (p <0.05), thus there is a direct positive influence on the attitude of knowledge about the environment IPM. The contribution of a given variable X1 to Y1: (0,526) 2 x 100 = 27.67%. Factors construct knowledge of the facts contributed to the dominant environment (.721) against environmental knowledge.

SEM estimation results with 22 Amos path coefficients obtained knowledge of the environment on behavior in an integrated pest management obtained a value of 0,145. Results of the test statistic t (C, R) knowledge environments positive influence on the behavior of farmers in IPM obtained value C, R of 2.716 and t table with a significance level of 5% and more than 29 df is 1,645, for C, R> t table (2,716> 1,645), and the significance value less than 0.05 (p <0.05), thus there is a direct positive effect on the environmental knowledge of the behavior of farmers in ecosystem-based pest control. Contributions made to the Y2 X3 (0,145) 2 x 100 = 2.10%. Factors construct knowledge of the facts contributed to the dominant environment (0,721) against environmental knowledge.

The estimation results obtained SEM with Amos 22 IPM path coefficient attitudes about the behavior of farmers in integrated pest management obtained a value of 0.082. Results of the test statistic t (C, R) knowledge environment has positive influence on the attitude of farmers obtained value C, R of 2.927 and t table with a significance level of 5% and more than 29 df is 1.645, for C, R> t table (2.927> 1.645), and the significance value less than 0.05 (p <0.05), thus there is a direct positive influence on the attitude toward the behavior IPM farmers in ecosystem-based pest control. Contributions made to the Y2 X3: (0.082) 2 x 100 = 0.67%. Construct affective factors contributed to the dominant (.851) against the attitude of IPM. While constructs factor control is an integrated alternative or dominant contribution (0,974) on the behavior of farmers in ecosystem-based pest control.

Furthermore, there is no influence indirectly through attitude IPM knowledge, knowledge of pesticides and environmental knowledge of the behavior of farmers in ecosystem-based pest control. Values lower contribution indirect effect through attitude than direct influence, as shown in Table 1 below.

TABLE 1: STANDARDIZED IMPACT OF DIRECT, INDIRECT INFLUENCE, EFFECT OF TOTAL AND CONTRIBUTIONS

Variable	*Direct Impact*			*Indirect Influence*			*Effect of Total*	
	Attitude	*Behaviour*	*Contri-butions (%)*	*Attitude*	*Behavi-our*	*Contri-bution (%)*	*Attitude*	*Behavi-our*
IPM knowledge	0,111	0,094	0,88	-	0,009	0,01	0,111	0,103
Knowledge Pesticides	(-) 0,462	(-) 0,105	1,10	-	(-) 0,038	0,14	(-) 0,462	(-) 0,143
Environmental Science	0,526	0,145	2,10	-	0,043	0,18	0,526	0,188
Attitude	-	0,082		-	-		-	0,082

Source; Results pengelohan Data Research, 2015.

Discussion

The study's findings indicate that environmental knowledge and significant positive effect on the attitudes and behavior of farmers high in the ecosystem-based pest management (IPM). That is the level of attitudes and behavior of farmers in the ecosystem-based pest control is explained by environmental knowledge.

The amount of the contribution of the knowledge environment that directly contributes to the attitude of the IPM by 27.67% and contributing to the behavior amounted to 2,10%. Therefore, to optimize the attitudes and behavior of farmers in the ecosystem-based pest control should endeavor to increase environmental knowledge. According Yuanturi (2013) that knowledge is a major and important foundation for the formation of a person's actions, including farmers in doing pest control technology. Initial stages required before a farmer adopting new behavior is knowledge. Farmers need to know in advance what the meaning and benefits of these technologies.

The results are consistent with some theories of behavior that the factors driving the changes in a person's behavior is knowledge. Environmental behavior model Hines *et al.* (1986) also emphasized the importance of knowledge of environmental factors that knowledge of action and issues, acting skills, the desire to act, situational factors and personality factors in changing behavior. The same is raised by Robbins (2009), that the factors which encourage a person behaves caused by four aspects, namely their knowledge, perceptions, attitudes and values of an object. Someone behave or move because of the need for a purpose. The behavior occurs because of the encouragement from within oneself. Encouragement in question, because of the desire to meet the needs that exist in a person. Relating to the matter, the person's behavior has characteristics such as; 1. The behavior is the way a person acts or behaves, 2. The behavior can serve as a guide for a person acting in a public environment, 3. Conduct an action or a reaction to something someone in certain situations, 4. Conduct an overall reaction or act in different situation.

Furthermore Chiras (1991), states that knowledge is the basis of the action is part of a behavior that will affect the surrounding environment. If someone has a good knowledge and correct on the environment, the environmental concern and perilakunnya would be good, otherwise if someone has a poor knowledge, the awareness and lead to bad behavior. The same thing was found by Tukiyat (2009), that with low environmental knowledge utilization disruptive impact on the environment and society. And human behavior will always make a reciprocal relationship with the environment. Studying environmental science aims to assist in overseeing the activities of man against nature in order to avoid damage. Thus knowledge of the environment-related facts, concepts and categories of the agricultural environment as a part of nature that should be preserved should be given to farmers in order to encourage the formation of behavior that ecosystem-based pest control (IPM) towards sustainable agriculture.

Further findings showed that the knowledge of IPM provides a positive and significant influence to the attitudes and do not have a significant influence on the behavior of farmers in ecosystem-based pest control. That is the level of farmer's attitude towards IPM is also determined by the IPM knowledge. The amount of the contribution of IPM knowledge that directly contribute to the IPM attitude of 1.23%. This study is reinforced by research Suartha (2011) and Juliana (2010), the same conclusion that there is a positive correlation between the level of knowledge of farmers with the attitude of farmers. Soedijo (2012), also concluded that the knowledge of IPM farmers in South Kalimantan with FFS capable of affecting the attitude of farmers, but the implementation of IPM concept has not been fully implemented. The study's findings also reinforced by the statement Notoatmodjo (2007), that attitude is a readiness or willingness to act and not a particular motif. Attitude is not an act or activity, but an act of a behavioral predisposition. In determining the attitude of knowledge plays an important role. The same was concluded Allum *et al.* (2005) that knowledge has a straight line to the attitude of an information received.

The study also found that attitudes IPM direct and significant effect on the behavior of farmers in ecosystem-based pest control. It means that the increase in farmers' attitudes towards IPM will lead to an increase in farmer behavior in ecosystem-based pest control. The amount of the contribution of IPM attitude that directly contribute to the behavior of farmers in ecosystem-based pest control at 0.67%. Therefore, to optimize the behavior of farmers in the ecosystem-based pest control should be pursued improvement of the attitude of IPM farmers. A positive attitude shown farmers about IPM it will exhibit the same behavior in the control of IPM. This study is reinforced by research Suhardi (2013) that farmers who have a positive attitude towards pesticides tend to behave better in use. Similarly, the results of research Yuliana (2010) concluded that there is a positive correlation between attitudes and behavior of farmers in pest control PBK in the cocoa plant.

Attitudes and behaviors are often said to be related closely, and the results also showed a strong relationship between attitudes and behavior. This is supported by Ajzen & Fishbein (2006), which states that between attitudes and behavior are the psychological factors that must exist for both to be consistent, that is the intention (intention). Taylor, SE *et al.* (2012) revealed that the relationship between attitudes and behavior can be reciprocated. Attitudes may control the behavior, and the behavior sometimes control the attitude. Furthermore Purwanto (1999), called the gesture as a view or a feeling that accompanied the tendency to act in accordance with the attitude that the object was. So always tearah attitude towards something, an object, no attitude without an object. Thus when addressing farmers IPM properly, it will then show the behavior of farmers in integrated pest management (IPM) well. Behavior in an integrated pest management (IPM) is the action or activity of farmers in conducting ecosystem-based pest control that uses the principles of IPM, which is monitoring the field, controlling the use of alternatives such as the use of natural enemies, and judicious use of pesticides that is timely, targeted, right dose, the right type and the right application.

Overall the findings of this study indicate that the behavior of onion farmers in ecosystem-based pest control turns causally tested directly influenced positively by the knowledge of the environment and the attitude of IPM farmers. Environmental knowledge of the most dominant influence on the increase in farmer behavior in ecosystem-based pest control. Similarly, the behavior of farmers in the ecosystem-based pest control is influenced by the attitude of IPM. While attitudes IPM directly affected by environmental knowledge and knowledge of IPM. Subsequent findings that the behavior of farmers in ecosystem-based pest control is not influenced indirectly by IPM knowledge, knowledge of pesticides and environmental knowledge through IPM attitude. This can be explained that the IPM knowledge and knowledge of the environment has not encouraged by the attitude of IPM farmers in improving the behavior of farmers in ecosystem-based pest control or in an integrated pest management (IPM). This means that the increase in farmers' knowledge has considerable influence on the behavior of onion farmers in the ecosystem-based pest control without having to increase the IPM attitude first.

Conclusion

Based on the results of data analysis and statistical calculations with SEM analysis as described earlier chapter, the findings of this study were obtained as follows: (1) Knowledge of the environment and knowledge of the IPM directly affects the attitude of IPM farmers; (2) Knowledge of the environment and positive attitude IPM direct effect on the behavior of farmers in ecosystem-based pest control; (3) The behavior of farmers in ecosystem-based pest control is not influenced indirectly by IPM knowledge, knowledge of pesticides and environmental knowledge through IPM attitude.

Based on the findings above, it can be concluded that the behavior of onion farmers in the ecosystem-based pest control in Sigi district directly affected by the environmental knowledge and attitudes IPM farmers. While the attitude of IPM farmers directly affected by the environmental knowledge and knowledge of IPM. Increased knowledge of farmers already enough onion farmer behavior in ecosystem-based pest control without having to increase the IPM attitude first.

This study gives an impact on the repertoire of science, particularly the strengthening of the existing behavioral theory that knowledge is an important domain and into the early stages of the change of attitude and then followed by changes in a person's behavior. The important factor to change the behavior of farmers in the ecosystem-based pest control is to increase environmental knowledge and attitudes IPM, not with the knowledge of IPM and pesticide only as long as this is understood. Knowledge of IPM only positive response by the attitude not by the behavior of farmers in integrated pest management (IPM). And the findings could be used as a reference in the overall crop protection, particularly in implementing IPM programs in the area.

Increased farmer behavior in ecosystem-based pest control can be improved by increasing knowledge about the environment and the attitude of farmers on IPM.

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