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The Adoption and Diffusion Process of Sustainable Agribusiness Management through the Role of Vocational High School Graduates

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ABSTRACT: Unsustainable agricultural development has an impact on land damage, decreased water quality, increased critical land and it is hoped that agriculture will transform towards sustainable agriculture. Sustainable agriculture is development that considers economic, ecological and social dimensions, so that agricultural development can be enjoyed by current and future generations. Sustainable agricultural development requires human resources as agents of change. The existence of Vocational High Schools in agriculture as a subsystem of national education is expected to produce graduates who have competence in the agricultural sector. Research on the process of conveying sustainable agribusiness messages through the role of Vocational High School graduates uses a phenomenological approach to understand the experiences of research subjects. The research subjects were graduates of Vocational High Schools who worked as farmers and extension workers with the sampling technique using snowball sampling by examining the role of graduates of Vocational High Schools as adopter farmers and distributors, non-adopter farmers, extension workers and extension officers who own farming businesses due to the success of the adoption process and Diffusion is influenced by information sources and message delivery methods. The results of the study show that the learning-by-doing method of information sources is considered effective in the process of adoption and diffusion of sustainable agribusiness.

KEYWORDS: Adoption, Diffusion, Sustainable Agribusiness

I. INTRODUCTION

Sustainable Development Goals (SDGs) are a continuation of the Millennium Development Goals (MDGs) which are the commitments of the member countries of the United Nations, including Indonesia. Regarding SDGs in Indonesia, Presidential Regulation number 59 of 2017 has been issued regarding the implementation of the Achievement of Sustainable Development Goals. Sustainable development consists of 17 goals, categorized into four dimensions or pillars, namely the pillars of economic development, the pillars of social development, the pillars of environmental development and the pillars of development of law and governance. Sustainable agriculture as part of the implementation of sustainable development is of concern to many countries. The concept of sustainable agriculture between regions or countries has various definitions and indicators.

Sustainable agriculture is a holistic farming concept which helps in meeting the needs of the present generation without affecting future generations [1]. Sustainable agriculture is defined as the use of agricultural practices and technologies which simultaneously: (a) maintain and increase agricultural productivity and profits while ensuring the sustainable supply of food, (b) reduce pollution and other negative externalities and gradually lead to positive ones, and (c) rebuild ecological resources (soil, water, air and biodiversity as “natural capital” assets) and use resources efficiently [2]. sustainable agriculture reduces the consumption of inputs (water, pesticides, and fertilizers) and increases crop productivity. The practice of replacing chemical pesticides with natural pesticides [3]. The concept of LEISA (*Low External Input Sustainable Agriculture*) improves the quality of the environment, humans and society [4],[5].

The most significant advantages of sustainable agricultural practices are the protection of water against pollution and the reduction of greenhouse gas emissions [6]. Long-term application of the LEISA rice farming system can reduce the need for synthetic fertilizer applications while increasing soil organic carbon [7]. Development practices that pursue productivity and ignore environmental aspects have a negative impact. The impacts of agricultural development include: 1) natural resource degradation and declining soil fertility, 2) expansion of critical land, 3) levels of pollution and environmental damage continue to increase, 4) decline in water quality, 5) poverty and unemployment rates in rural areas remain high [8],[9],[10],[11]. Based on the explanation above, the implementation of sustainable agriculture is important. Not only limited to the obligation to follow the agreement. The Ministry of Agriculture's Strategic Plan (Renstra) for 2020-2024 explicitly transforms agriculture through the paradigm of sustainable agricultural development in the downstream and upstream sectors. Agricultural development is said to be sustainable if it fulfils the three pillars, namely economically, socially and ecologically sustainable [12],[13],[14].

Sustainable agricultural practices in Indonesia face several obstacles, suggesting that farmers have not yet practiced Integrated Pest Management (IPM) for environmental sustainability because the recommendations are voluntary. Weak sustainable agricultural practices in Indonesia caused by several factors are a challenge in agricultural development. Diffusion of sustainable agricultural innovations is needed. The diffusion of innovation requires interpersonal networks through opinion leaders and agents of change. Graduates of agricultural master's vocational schools who have agricultural competence are expected to become agricultural human resources both as natural business actors and agents of change [15]. The existence of a change agent for sustainable agribusiness in order to change the knowledge, attitudes and skills of farmers. Farmers become adopters of sustainable agribusiness. Land management behavior and affective attitudes of farmers are the most significant factors influencing the behavior and attitudes of farmers in determining how to farm.

Delivery of sustainable agribusiness messages apart from the aspect of the actor who conveys it, needs to examine the aspects of the source of knowledge and the process of conveying the message. Depart from this background. This study aims to understand the sources of information about sustainable agribusiness among vocational high school graduates and the process of conveying sustainable agribusiness messages played by vocational high school graduates.

II. STUDY METHOD

This study uses a phenomenological approach. The phenomenological approach focuses on meaning, tries to understand what is happening, sees the totality of each situation, develops inductive thinking. Reality is the result of subjective construction. Phenomenological approach to subjects studied in natural contexts. Phenomenology provides an in-depth understanding of an experience [16].

This study used in-depth interviews and observation methods. The key informants in this research were vocational high school graduates who worked in the agricultural sector, both as farmers and extension workers. Key informants were selected using the snowball sampling technique. Characteristics of key informants are presented in Table 1.

Table 1. List of key informants

No	Initials Informant	Characteristics of Informants	work
1.	P	Male, 26 years old, last education vocational high School	Paddy rice farmer
2	D	Male, 23 years old, last education vocational high School	Paddy rice farmer
3	AN	Male, 21 years old, last education vocational high School	Paddy rice farmers and horticultural crops
4	F	Male, 22 years old, last education vocational high School	Hydroponic vegetable farmer
5	J	Male, 26 years old, last education vocational high School	Pepper Farmers and Cattle farming business
6	R	Male, 35 years old, last education S1 Agribusiness	Horticultural crop farmer, Head of farmer group, Facilitator READSI
7	HM	Male, 44 years old, last education S1 Animal Husbandry	Horticultural crops growers and Leader of the farmer group
8	M	Female, 40 years old, last education S1 Agriculture	Extension worker and owns a farming business
9	NH	Female, 43 years old, last education S1 agriculture	Extension
10	RW	Male, 44 years old, last education S1 Agribusiness	Extension
11	S	Male, 38 years old, last education S1 Agribusiness	Extension worker, has a farming business
12	WL	Female, 31 years old, last education S1 Animal Husbandry	Extension worker and owns a farming business

Source: Research Results, 2022

III. RESULTS AND DISCUSSION

A. Results

Graduates of Vocational High Schools in agriculture have competence in agriculture. Graduate competence concerns the domain of knowledge, attitudes and skills in agriculture. Sources of sustainable agribusiness knowledge aside from being obtained from formal education, graduates obtain this knowledge through counseling, training and media activities. Based on the source of knowledge and the process of delivering sustainable agribusiness messages, the roles of graduates are categorized into four categories. These categories are: (1) non-adopter farmers, (2) adopter farmers and carry out sustainable agribusiness diffusion, (3) extension agents, (4) extension agents own farming businesses.

THE ROLE OF GRADUATES AS FARMERS

Graduates of Vocational High Schools who act as non-adopter farmers have characteristics including recent Vocational High School education, owning paddy rice farming, horticultural crops and pepper plants. Never participated in extension activities and was not registered as a member of a farmer group. There was one graduate who was registered as a member of a farmer group, but the farmer group has been inactive for two years.

Agricultural competence obtained at the formal education level provides capital in cultivation, as stated by an informant (AN, 21 years old, horticultural crop farmer), as follows:

"*I learned to make beds at school, the basics of planting were obtained from school, including fertilizing and even making biopepstisia, even though biopepstisia is not used in cultivation*"

The same thing was stated by informant (P, 26 years old, lowland rice farmer)

"*We were taught how to use tractors, make manure and fertilizers, we held exhibitions of cultivated products, and residents came to buy our cultivated products*"

Knowledge about the negative effects of unwise use of inorganic fertilizers and pesticides has been acquired since the Vocational High School. In practice, farmers are still inseparable from the use of inorganic fertilizers and pesticides. Mimicking the habits of farmers in their environment and the perception that the use of organic fertilizers is needed in larger volumes, management is required before use, so it is not efficient. This is as in the interview excerpt:

"*Organic fertilizer requires a lot of capital. Chemical fertilizers are used sparingly and the capital is not much* (AN, 21 years old, paddy rice farmer).

"*If you use organic fertilizers, the results may not be good, the rice will turn white and the harvest may fail*" (F, 26 years old, lowland rice farmer).

Cultivation of paddy rice using organic fertilizers was carried out by informant (D, 23 years old, lowland rice farmer) as stated as follows:

"*When fertilizer was scarce, we used organic fertilizer using fertilizer from sown broiler chicken manure, there was no use of NPK, one month later we embroidered, many snails and rats were found, the rice field water became itchy. After that, we never used organic fertilizer again*"

According to the informant (D, paddy rice farmer, 23 years old) pest spraying is done by paying attention to the attacking pests. Spraying is done every two weeks. If the pest population increases, spraying is usually done once a week

"*Farmers have knowledge about the impact of using chemicals but it is difficult to implement because organic use requires capital. Inorganic pesticides are easily available and affordable*"(D, paddy rice farmer, 23 years old).

The same thing was expressed by the informant (F, lowland rice farmer, 26 years). The use of inorganic pesticides at the lowland rice farmer level depends on the type of pest that attacks. Regular spraying uses the Alika trademark pesticide to eradicate caterpillars and ticks. Exterminate informant leafhopper pests using Starban brand insecticides. Spraying is usually done 12 days after planting.

The use of inorganic pesticides is unavoidable. The rainy season and high rain intensity encourage farmers to use inorganic pesticides intensively. The spraying process was carried out by the informant (AN, lowland rice and horticulture farmer, 21 years old). The application used is stated in the following interview excerpt:

"*When growing tomatoes, I used 7 kinds of pesticides in one application, the materials used included: Prepaton, Beskonil, Amistartop, cng calcium, Milk calcium, Antrakol, Adhesive. It is sprayed twice a day, especially during the rainy season, it is feared that fungi and bacteria will attack the tomatoes*"

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THE ROLE OF GRADUATES AS ADOPTER FARMERS AND DIFFUSION ACTORS

Characteristics of farmers who are adopters of sustainable agricultural agribusiness in this study have an undergraduate level of education in agriculture, carry out horticultural crop cultivation, head of farmer groups, are active in extension activities. Apart from obtaining knowledge about agriculture in formal education, it is also obtained from extension activities. This is in accordance with the nature of the interview excerpt as follows:

"*We make compost, leaves, straw, cow dung, gamal leaves, bran, given em4 decomposers for 2 weeks to become solid fertilizer. I learned from the heads of other farmer groups, and PPL from the district. After that we practiced it in farmer groups, I used the results of my practice. When fertilizer is expensive, farmers make compost*" (R, 35 years old, horticultural farmer, head of farmer group, READSI facilitator).

"*I got knowledge about cultivating hydroponic systems at Vocational High Schools, then I learned from hydroponic communities and learned from hydroponic practitioners who had received training and were certified*" (F, 22 years old, hydroponic vegetable farmer).

Apart from being an adopter, the informant also carried out sustainable agribusiness diffusion as stated by the informant as follows:

"*When using mulch, local farmers were not interested in using mulch, because farmers thought the price of mulch was expensive. However, after they see the yields, mulch saves energy, reduces the use of herbicides, so now farmers use mulch*" (R, 35 years, horticulture farmer, farmer group leader, READSI facilitator).

Likewise with the informant (F, 22 years, hydroponic vegetable farmer) based on interviews and observations. The informant helped Kendari 5 Vocational High School and assisted in the Youth Social Institution, to make hydroponic plant installations. In addition, informant F assisted him to succeed in cultivating these hydroponic plants

Diffusion of sustainable agribusiness carried out by the informant (HM, 45 years, horticultural crop farmer, farmer group leader) as quoted in the following quote:

"I conveyed to the farmer groups, to use pesticides according to the dosage, at the right time of spraying, but it was still difficult to accept. The use of local wisdom by using the Lepuri plant which is burned to eradicate caterpillars, is still used by farmer groups"

Agribusiness diffusion delivered by farmers to other farmers is more effective than extension agents. This is as stated by the informant as follows:

"*Farmers believe more in what they have seen, not what they hear, if there is only one farmer who adopts a sustainable farming system, he will be an example for other farmers, and this is easier for farmers to accept, this approach is considered effective, compared to just what is said instructor*" (RW, 45 years, extension worker).

So that currently the role of extension workers is to produce farmers who adopt sustainable agribusiness, then these farmers as actors of sustainable agribusiness diffusion to other farmers.

"*If there are 20 farmers who are trained, 1 person who implements it is already a success, because farmers have to see it first hand, so the current strategy is how farmers who have adopted sustainable agriculture will be an example for other farmers, and this approach is considered effective*"(RW, extension worker 45 years).

The Role of Graduates as Extension Workers

Extension agents as State Civil Apparatus have the duty and function of providing guidance to farmer groups. The characteristics of the extension workers in this study were S1 agricultural graduates (who graduated from a Vocational High School in agriculture), had a group of assisted farmers.

Extension agents as agents of change in the diffusion of sustainable agribusiness essentially carry out the process of delivering sustainable agribusiness messages. The aim of the diffusion is for knowledge, attitudes and skills of farmers, so that farmers are expected to adopt sustainable agribusiness in five dimensions. The counseling methods carried out by extension workers, as in the following interview excerpt:

"*The KWT under construction makes vegetable pesticides using ingredients from srikaya leaves added with tobacco, then settling for a week. Use of pesticides to eradicate caterpillars and pests*"(NH, 44 years old, extension worker).

"*Before making biopepsticides, we have to identify which pests are attacking. If the pests are rats, we can make biopepsticides using raw papaya which is chopped, then placed in holes that are thought to be nesting rats*" (RW extension worker, 45 years).

"*Together with farmers, we make NPK fertilizer from natural ingredients using Gamal leaves which are high in Nitrogen (N), green plant branches as a source of Phosphorus and Potassium (K) from straw, then fermented using EM4*" (S, 38 years, full length).

Based on excerpts from interviews, extension workers carry out extension activities through the performance method, namely together with farmers to make organic fertilizers and biopepstisides. This method is considered effective compared to the lecture method.

The Role of Graduates as Extension Workers and Farming Actors

Graduates who have an extension role in farming have the characteristics of Bachelor of Agriculture graduates, fostering farmer groups, owning horticultural crop farming, and being involved in crop engineering. In addition to carrying out counseling in accordance with the main tasks and functions, Extension workers who have farming businesses share their experiences with farmers, this is as stated in the interview excerpt as follows:

"*An approach to farmers, by sharing experiences, we cannot patronize, however, farmers have more experience than us*"(S, extension worker, 37 years).

The same thing was conveyed by informant M extension worker who has a horticultural crop farming business. Has 1 hectare of land used to plant chilies. Sharing experiences is an effective way, as in the interview quotes:

"*I emphasize experience more than theory, even if we know the knowledge but never put it into practice it is definitely different. It is better if the extension agent has a farming unit, or pilot, before conveying it to the farmers, the extension agent will conduct a trial run, if successful then it will be conveyed to the farmers. Farmers are quicker to respond or trust*" (M, extensionist and owns a farming business, 40 years).

"*I told the farmers to plant chillies. Because the marketing is good, and the technology is available. Before telling farmers about fertilizers, I usually do trials. However, we also sometimes learn from the experiences of successful farmers"*(M, extension worker and owns a farming business, 40 years).

In addition to sharing experiences, the technical assistant invited the assisted farmers to see cultivation that was developed without the use of inorganic fertilizers and pesticides. This method is used to convince farmers that cultivation by reducing the use of chemicals can be carried out, this is as stated in the following interview excerpt:

"*I usually invite my assisted farmers to walk home, see how I cultivate various plants without using chemical fertilizers and inorganic pesticides*"(S, extension worker and content creator, 37 years).

Likewise with the informant (WL, 30 years old, extension worker, owns a farming business). Informant WL cultivates horticultural crops, using BPP land with a loan system. The area of cultivated land is 1 hectare. The cultivation of horticultural crops is very profitable, the planting time is quite short and the farming business actors have no marketing difficulties. Based on the following interviews, it provides an illustration that farming can be used as a pilot:

"*I'm usually a farmer going for a walk to the garden, if the yields are abundant I sometimes give it to the surrounding community, so that they are also interested in gardening*".

B. Discussion

Adoption and diffusion of sustainable agribusiness requires actors as actors. This research provides an understanding that actors in the adoption and diffusion of sustainable agriculture are graduates of vocational high schools in agriculture. graduates have competence in agriculture as output of Vocational High Schools in agriculture.

Education at the Vocational High School level contributes to knowledge, attitudes and skills in agriculture, as initial capital when graduates work as farmers, extension workers or continue their education at a higher level. Knowledge and technology in agriculture continues to develop, so that the self-development of farmers and extension workers is still carried out.

In addition to the actors in sustainable agribusiness, the existence of a network is very important. The network determines the delivery pattern of the message/communication. There are two networks in the process: (1) actors who have formal relationships and vertical structures, (2) informal relationships and horizontal knowledge. In addition, the research examines the learning methods used for the adoption and diffusion of sustainable agribusiness at the farmer and extension worker levels.

Farmer knowledge and farmers' attitudes towards sustainable agriculture greatly determine the success of sustainable agriculture [17],[18]. The farmer's attitude towards sustainable agriculture is influenced by the counseling that the farmer attends. Neutral attitude towards sustainable agricultural practices, lack of counseling has a significant relationship with farmers' attitudes towards sustainable agriculture [19]. Farmer agricultural competency development can be carried out by being active in farmer group activities and counseling. Farmers' knowledge and perceptions about sustainable agriculture are based on general knowledge, not specific knowledge obtained through formal education [20].

Adoption and diffusion of sustainable agribusiness can be more effective, if the adoption and diffusion actors are carried out by farmers. New adopters are usually found near farmers who have already adopted an innovation [15]. Informal learning facilitates the diffusion of innovations because farmers more easily adopt practices accepted by their peers [21].

Farmers learn from other farmers in conservation farming. For small-scale farmers, membership in farmer groups can be a conduit for better access to extension services and for exchanging experience and information with other farmers [22]. The findings of this study graduates have a role as adopter farmers as well as sustainable agribusiness diffusion actors characterized by a high level of education (S1), active in farmer groups or other farming communities, status as head of farmer groups. Knowledge aside from formal education, is also obtained through extension activities. Extension agents and owning a farming business have competence in the field of extension. Have experience in farming cultivation. Extension competence and experience in farming is an important element in farmers' acceptance of extension agents.

Extension activities or knowledge sharing about sustainable agriculture in formal and informal networks. Using the lecture method is considered less effective. Actor research findings in sustainable agribusiness diffusion use the learning by doing model. Extension agents together with assisted farmers, or fellow farmers make organic fertilizers and biopepsticides sourced from natural resources available in the farmers' environment. This counseling activity is a learning by doing process.

The learning by doing method comes from John Dewey's view of experience and education. John Dewey stated that education is a reconstruction of various experiences and events experienced by individuals, so that everything new becomes directed and meaningful. Experience as a foundation in education must be emphasized on practice, trial and error. The principles of continuity and interaction are two important points in Dewey's view.

The principle of continuity implies that all experiences are brought forward and influence future experiences; every experience in one way or another influences all potential future experiences. The interaction principle is based on the concept of continuity and implies the interaction between the learner and what is learned, and how past experiences interact with present situations to create one's current experiences [23]. Learning by doing is facilitated through experience. Learning is said to be the result of offering people the opportunity to engage with concrete 'real world' sustainability problems and the space to explore them, trial solutions, play around with assumptions, fail, try again, etc. Openness and flexibility [24].

Studies on the positive impact of learning by doing can improve competency through collaboration which not only gains knowledge but also values that guide action [25],[26]. The increase in farmers' income is in line with the increasing experience, learning by doing, social networks that are built [27]. Through learning by doing they will develop the confidence to apply these skills [28]. Farmers who do not adopt sustainable agribusiness are farmers who are not registered as members of farmer groups and have never participated in extension activities. Many agricultural messages are obtained through the process of imitating the habits of farmers in their environment. Even though this experience is a conventional agricultural practice that does not pay attention to ecological aspects.

IV. CONCLUSIONS

Actors of adoption and diffusion of sustainable agribusiness played by graduates of Vocational High Schools in agriculture can be categorized into four roles: (1) role as farmers, (2) adopter farmers as well as diffusion actors, (3) extension workers, (4) extension agents who own farming businesses . Each actor has a different source of knowledge. Sustainable agribusiness knowledge apart from formal education, is also obtained through outreach activities, training and through the media. Nonadoptor farmers of sustainable agribusiness sources of sustainable agribusiness information are obtained through formal education. Adopter farmers obtain knowledge apart from formal education, counseling, the media contributes to shaping this knowledge. Extension officers as civil servants who foster farmer groups gain sustainable agribusiness knowledge through formal education, training and media. Sustainable agribusiness messages carried out by adopter farmers, extension workers and extension workers who have farming businesses with a learning by doing approach (learning and doing). Adopter farmers and extension workers who have farming businesses have the opportunity to gain the trust of farmers. In addition to having sustainable agribusiness knowledge, they also have farming experience. Farmers are more able to accept or believe messages that are seen by their eyes, not just heard.

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