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Understanding Organic Agriculture in Batur Village: Notes Toward Sustainable Food System

Penerapan Sustainable Food System pada Kelompok Tani di Desa Batur

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ABSTRACT

Background: Recently, the increase in population and the shift in food consumption patterns has affected the whole food production system. In addition, it encourages the government to implement imports, which causes a fluctuation of food prices and can affect food vulnerability for the poor. Most of the population in Indonesia live as farmers in the countryside. Some of them tend to struggle because of the uncertainty of food production which is caused by the limitations of natural resources, climate change, and natural disasters. Consequently, it makes them food insecure. Some of the farmers have already employed organic horticultural agriculture. It means indirectly they have already applied a sustainable food system that has a positive impact on three-dimensional aspects: economic values, social benefits, and environmental sustainability.
Objectives: The purpose of this study is to determine the extent to which farmers have implemented a sustainable food system.
Methods: With the qualitative method, this research uses Focus Group Discussion (FGD) and in-depth interviews approach to find out the opinions of participants on implementing a sustainable food system.
Results: It can be confirmed from this research that all of the participants have applied the sustainable food system (SFS) theory from their own perspectives. They consider using less chemical fertilizer and pesticides, sharing information about how to manage pests, fungus, and diseases among the farmers; and using the intercropping method. Based on those activities, they construct their own sustainability.
Conclusions: The conclusion from this study found that participants have implemented SFS in different ways, although the SFS theory carried out by research participants has the same goal, namely for sustainability for future generations.

ABSTRAK

Latar Belakang: *Peningkatan populasi dan pergeseran pola makan yang terjadi saat ini berdampak pada ketidakstabilan pangan dan ketidakpastian hasil produksi pangan. Keadaan tersebut mendorong pemerintah untuk melakukan impor sehingga mengakibatkan fluktuasi harga pangan dan berdampak terhadap kerawanan pangan pada kelompok miskin. Di Indonesia, sebagian besar masyarakat miskin bertempat tinggal di pedesaan dan berprofesi sebagai petani. Sebagian petani mengalami kesulitan dikarenakan ketidakpastian panen yang disebabkan oleh keterbatasan sumber daya alam, perubahan iklim, dan bencana alam sehingga menyebabkan terjadinya kerawanan pangan. Beberapa petani telah menerapkan pertanian hortikultura organik, secara tidak langsung sudah menerapkan sistem pangan berkelanjutan. Sistem pangan berkelanjutan berorientasi pada tiga dimensi, yaitu keberlanjutan ekonomi, kehidupan sosial, dan lingkungan.*
Tujuan: *Tujuan penelitian ini untuk mengetahui sejauh mana petani sudah menerapkan sistem pangan berkelanjutan.*
Metode: *Dengan metode kualitatif penelitian ini menggunakan pendekatan Focus Group Discussion (FGD) untuk mengetahui pendapat partisipan dalam melakukan sistem pangan berkelanjutan serta menggunakan wawancara mendalam.*
Hasil: *Hasil dari penelitian ini partisipan telah menerapkan teori Sustainable Food System (SFS). Partisipan memiliki pandangan mereka sendiri tentang teori SFS. Partisipan beranggapan dengan mempertimbangkan penggunaan pupuk kimia dan pestisida, saling berbagi informasi terkait penggunaan obat untuk masalah hama, jamur dan penyakit, serta mendapatkan keuntungan beragam karena menggunakan metode tumpang sari, berarti mereka sudah menjalankan SFS.*

Kesimpulan: *Kesimpulan dari penelitian ini menemukan bahwa partisipan sudah menjalankan SFS dengan cara penerapan yang berbeda, walaupun demikian teori SFS yang dijalankan partisipan penelitian memiliki tujuan yang sama yaitu untuk keberlanjutan bagi generasi mendatang.*

Kata kunci: *Kerawanan pangan, Pedesaan, Petani, Sistem pangan berkelanjutan*

INTRODUCTION

The growing population in Indonesia has changed significantly over the past ten years with an annual growth rate of 1.33%[1]. The growth in population gives rise to a change in diet. The shift in people's diet from cereals and tubers to animal proteins has an effect on producers who end up only concentrating on fulfilling meat needs and increasing meat consumption[2]. This situation also encourages the government to import crops to comply with national food needs. Unfortunately, food imports have resulted in soaring food prices which has an impact on the inability of the poor to meet their food needs[3].

The inequality of economic status that occurs in destitute families is closely related to food access[4]. Poverty is the main cause of people's inability to buy food of good quality and meet their daily food needs. The need for insufficient food intake, one of which is due to the difficulty of the impoverished group in accessing food because the distance traveled is far enough and the limited economic income to buy food makes them unable to obtain a variety of food. This condition will gradually have an impact on health problems[5.6].

According to the Central Statistics Agency data, 12.85% of the population in Indonesia who experience destitute conditions live in rural areas and depend on the agricultural sector[7.8]. Research conducted by Prihatin, Hariadi, and Mudiyono (2013) stated that some people who work as farmers tend to experience food insecurity[9]. This occurs due to crop uncertainty caused by limited natural resources in some areas, climate change such as excessive rainfall or low rainfall, and natural disasters that cause food insecurity.

The food problems cause most farmers to be affected by food insecurity. This problem encourages them to try to farm with organic systems by not using synthetic chemicals to prevent damage to natural ecosystems. What farmers are doing turns out to be an effort to get out of the problem of food insecurity[10]. The sustainable agricultural sector will have an impact on food sustainability and is oriented toward three dimensions, namely economic business sustainability, social life, and ecology[11]. In addition to causing positive impacts on the environment and society, farmers can also improve their economy because there is starting to be awareness from some people who are starting to switch to a healthy lifestyle so that the demand for organic food[12] begins to increase. These efforts include a sustainable food system[13].

Currently, research about sustainable food systems implemented by farmers is still rare; there are similar studies but only limited to discussing food availability and community food systems. Research on sustainable food systems usually only discusses the sustainability of the food availability system[14], the approach of rural communities in a sustainable manner in order to realize food sovereignty[15] and a healthy diet by implementing the Sustainable Food System[16]. The purpose of this study is to find out the extent to which farmers have implemented a sustainable food system. This research is expected to be a reference in the next study which discusses how deep the sustainable food system has been carried out by farmers in villages, to reduce food problems in Indonesia.

METHODS

This research used qualitative methods with a descriptive approach. The data collection technique was carried out by in-depth interviews and Focus Group Discussions (FGD) with horticultural farmer groups discussing the extent of the sustainable food system that has been implemented by farmers in Batur Village, then digested and processed the information to be returned to participants, then reflected and discussed again together in the following week to find solutions obtained from participants. This research was conducted in October-April 2021 in Salatiga, Central Java. Salatiga City is one of the areas that has horticultural agricultural potential, especially in Batur Village, Getasan District. In 2018, Batur Village became the area with the highest number of farmers growing vegetable and fruit commodities horticulturally[17]. Currently, some farmers in Batur Village are implementing a type of horticultural agriculture which is one of the efforts in implementing a sustainable food system. The criteria in the study were divided into two, the inclusion criteria and the exclusion criteria. The inclusion criteria were working as a fruit and vegetable horticultural farmer, domiciled in Batur Village, Getasan District, able to communicate well and willing to be a participant. Meanwhile, the exclusion criteria were farmers who had side jobs and farmers who had physical problems. The was carried out with the coding process and then the researcher made a narrative every time they finished having a meeting to reflect by giving one sentence. This research has also received approval from the ethics commission No. 016/KOMISIETIK/EC/IX/2020.

Obstacles experienced by researchers during the data collection process were varied, such as difficulty finding a time that suited all participants so that this is addressed by conducting meetings the first two times with three participants and the second meeting with two participants; uncertain weather also made it difficult for researchers to get to the location. Obstacles were also felt when doing FGDs with the method of writing or expressing feelings through writing on paper that cannot be carried out because there were participants who could not read and write, and other obstacles faced by researchers were the COVID-19 pandemic, such as the emergence of fear, worry from themselves because of fear of contracting or transmitting people around them when the FGD process in the result some participants did not use masks.

RESULTS AND DISCUSSION

Desire to Become a Horticultural Farmer

The disappearance of interest in rural young people working as farmers according to White (2020) showed that there are things that affect the lack of interest, one of which is because the school currently does not provide invitations related to working as farmers[18]. This problem causes a level of doubt for young people whether they work as farmers and prefer to work in urban areas. This is also supported by research conducted by Susilowati (2016) which declared that young farmers are increasingly unpopular due to the rejection factor carried out by parents in the village[19]. Parents in rural areas do not want their children to become farmers like them and rather advise their children to work in urban areas[19]. The argument from the research of Susilowati (2016) and White (2020) turned out to be inversely proportional to the results of a directed discussion with participants (July, 2020), because the five participants who came from Batur Village had a desire, even one of them said that becoming a farmer was an ideal job for them.

The ideals and desires of becoming a farmer exist from childhood to adulthood. When they were teenagers, the participants' parents supported the participants by teaching the stages or how to farm. The five participants said that parents played an important role in their process of becoming farmers, especially becoming horticultural peasants. This was acknowledged by one of the participants who said: "from a young age I have been taught to plant on the farm" (2nd participant, July 2020).

This high urge to become a peasant was realized when the participants began to be productive as farmers, that is, after they graduated from school. When they were teenagers, they only followed or helped with the family farm, but when they graduated they became more serious about exploring and plunging directly into becoming farmers. The type of agriculture chosen by the five participants was horticultural type agriculture because it looked at the topography of Batur Village which is in the highlands and the climate that supports it.

This desire to become a farmer is also driven by the interactions that occur between farmers. Starting from a young participant who often helped in the field, interactions with other farmers arose. This interaction that often occurs between farmers makes the motivation to become a farmer increase. The interaction made one of the participants say that there was knowledge or learning gained so that it would further add knowledge and motivate participants to become farmers.

Planting Process and Technique

Planting techniques in Batur Village are carried out with an intercropping model or in one hole there are 2-5 types of plants (Tumpangsari model). This intercropping can produce a variety of diverse types so that farmers can generate diverse profits and this can improve the farmer's economy. The profit obtained by the intercropping model according to one of the participants was about twice as much as that of the monoculture farming model, so farmers got greater profits. This is also supported by research by Buana and Suswandari (2020) which states that this tumpeng sari planting model can help farmers benefit more from this planting technique[20]. It was also acknowledged by one of the participants:

"Intercropping here is like one plant has not been harvested has been added next to it, that's so that yes it can cover our needs, so sometimes there are harvests in unison so that at all the land is never empty and is always used" (Participant 3, July 2020).

The choice of intercropping agricultural techniques also has an effect on the social side. The existence of this diversity of crops makes farmers more able to work with various middlemen from Salatiga, Semarang and Yogyakarta, in terms of profits. This can be beneficial for farmers because it can increase friendship relationships. Through friendships with middlemen, according to one of the participants, they benefited. The advantage obtained is in the form of a selling price which is sometimes higher than around Rp. 500-1,000 per kilogram compared to other farmers.

The economic benefits gained by participants are sometimes higher than those of other farmers. In addition to these benefits, farmers also get other benefits, such as getting information related to sales prices earlier than other farmers. Information related to the sales price is obtained from middlemen in the market because they often know the renewal of vegetable and fruit prices in the market first. After the farmer finds out for which of his crops the price is high and which price is falling. This is useful for farmers to take into account the profits obtained in one harvest so that farmers can count the adequacy of the capital obtained to start new agricultural planning. Another advantage that farmers feel is in terms of transportation services for delivery. If farmers know the owner of transportation services or transportation service providers; participants in the form of transportation service prices are slightly cheaper than the price of using transportation services in general.

After looking at the economic and social side, researchers saw from the environmental side. The selection of this intercropping agricultural technique provides an advantage for the environment. This is also supported by the research of Handayani (2011) which showed that the use of intercropping technique has many advantages over the monoculture technique[21]. According to one of the participants, using this intercropping agricultural technique helps farmers in utilizing existing land by producing 2-5 types of plants at once. In addition, its advantages can help the soil become more fertile because it can reduce the risk of crop failure and suppress the growth of weeds, pests, and diseases compared to monoculture farming techniques22. Another advantage also said by one of the participants: "This technique can suppress weed growth so that it can reduce the increase in pesticide use" (Participant 5, July 2021). This advantage made

participants choose to use the intercropping as a planting technique.

The benefits obtained by using this intercropping technique are also related to the Sustainable Food System (SFS) in the economic and environmental components[23]. The economic benefits obtained by farmers are in line with SFS because they are able to increase income. On the other hand, the environmental sustainability owned by farmers is in line with SFS because they can consider the diversity of biodiversity, flora, and fauna by not using too many chemicals. When they have implemented this, they have already played a role in maintaining sustainability for future generations.

Fertilizer Use Considerations

The use of fertilizer in the farming process is important because it has various benefits for plants that can support the success of the agricultural process. Fertilizers are divided into two types, organic fertilizers and inorganic fertilizers. Basically, applying fertilizer to plants can increase production and crop quality[24]. Organic fertilizers are used as a source of food substances for plants and increase the productivity of nutrients in the soil while the function of inorganic/chemical fertilizers is to stimulate plant growth[24]. The selection and dosage of fertilizer can have a positive impact and a negative impact, so it is very important to consider the use and dose selection. After a directed discussion with the participants (July, 2020), they use manure and chemical fertilizers to enrich their crops.

Generally, peasants process their own manure, because each participant has livestock in their homes. They raise cows, goats, and chickens. Usually, they use manure from their livestock to be processed into fertilizer, as noted by a participant on July 3, 2020: "I usually use manure or compost that I process myself from the results of my manure, and I also use chemical fertilizers as well." The manure they processed is also mixed with the remains of vegetables and fruits derived from kitchen residues or damaged crop residues. This process is quoted from a citation of a directed discussion with Participant 5, July 2020: "The principle of agriculture is that if it doesn't sell well, its vegetables are made into fertilizer. Later, it will be planted again, if it sells well, thank God." The process of processing manure also involves the help of family members. This shows the social interaction that occurs between participants and family members. The processing of this manure takes a long time and is often less than the amount needed, so participants have to mix it with fertilizer purchased in a store.

Although farmers prefer manure, in some processes of planting they still use chemical fertilizers. Chemical fertilizers that are often used are Urea fertilizer, Phonska Gresik fertilizer, and Za fertilizer (Participant 5, July 2020). The use of chemical fertilizers according to participants is used as a stimulant for the soil to remain fertile because, currently, participants feel that the soil is becoming more "spoiled." The soil became "spoiled" according to the participants due to the effects of the high use of chemical fertilizers in the past. This problem makes participants have to continue to use chemical fertilizers. Another reason besides being a soil stimulant, chemical fertilizers are also used to reach market demand in order to provide the demand for fruits and vegetables of good quality. Good sales results that can reach market demand cause a sense of satisfaction felt by participants. In addition to obtaining good quality crops, participants also get material benefits. These reasons are what encourage participants to continue using chemical fertilizers until now.

As stated by the participants, the use of chemical fertilizers can make the soil a stimulant to remain fertile, nourish plants, and can cause a sense of satisfaction for farmers, but, if it is used excessively and continuously, it can have a negative impact on the environment. The negative impact of the use of chemical fertilizers, according to research by Soekamto and Fahrizal (2019), is that the use of chemical fertilizers remaining in the soil can cause the soil to become adhesions or not friable, kill nutrient-forming organisms (soil-fertilizing organisms), and if used continuously without regard to the dose of chemical fertilizer use can cause the soil to become dependent on the use of chemical fertilizers[25]. In addition, the research by Simanjuntak, Lahay, and Purba (2013) also said that the impact of the use of long-term chemical fertilizers can cause deer soil structure, decreased soil organic levels, and environmental pollution[26]. This was also revealed by one of the participants:

"The use of chemical fertilizers that I use can indeed have a bad impact on the environment because it often makes the soil unfriendly, hard, and causes dependence on the use of chemical fertilizers. But what's more, now the soil here has begun to be dependent so that it must continue to use chemical fertilizers so that the results are satisfactory and avoid pests and diseases" (Participant 1, July 2020).

Virtually, from the results of a focused discussion together with participants (July, 2020), participants have known the negative impact of using chemical fertilizers. From this sense of knowing the negative impact, one of the things that participants did to reduce the impact was by using a larger dose of organic fertilizer compared to chemical fertilizers. This is similar to what was found in the research of Simanjuntak, Lahay, and Purba (2013) by considering the use of chemical and organic fertilizers. The ratio of organic fertilizers is as much as 2 to 2.5 tons and chemical fertilizers as much as 150 kg. This participant statement shows that the use of organic and chemical fertilizers is not only because it is required to meet economic needs but also to reach the market demand. However, participants have considered to use organic fertilizers rather than chemical fertilizers.

The use of mixed fertilizers in the planting process was revealed by the participants that Batur village's farm is considered a semi-organic type and still uses chemical fertilizers as a mixture. Yet, according to them, prioritizing the use of organic fertilizers is one of the methods to maintain environmental and economic sustainability. When participants apply semi-organic and

still use chemical fertilizers, participants emphasize environmental sustainability with the point of being able to consider biodiversity, water, soil, flora, fauna, and economic sustainability and of being able to increase income. This point makes participants think that what they have done so far is included in the steps toward sustainability for the reason that it can maintain diversity by using fewer chemical fertilizer comparisons compared to organic fertilizers.

From what participants have revealed, they are indeed trying to remain concerned about future generations by continuing to consider the use of chemical fertilizers. Actually, the SFS concept according to FAO's view has the aim of providing future generations with food security and nutrition that has an impact on three components of sustainability, namely economic, social, and environmental[23]. The difference in views occurs between participants' thoughts and existing SFS theories because participants have their own views regarding sustainability through local knowledge. The local knowledge gained by these participants was based on the direct experience they felt if they continued to use chemical fertilizers which generate losing soil. The soil was infertile caused by dead soil-fertilizing organisms. When they start to know and feel the impact, participants don't want this to happen to later generations. Although applied in different ways, these two views both have the goal of attaching importance to the sustainability of future generations.

Pesticide Usage Considerations

Farmers use organic fertilizers to provide fertility and provide nutrients for plants. In addition, farmers also use pesticides to protect their crops from pests, fungi, and diseases. In the beginning, how to get rid of pests was only by killing with human labor. But as time passed, they began to arise the discovery of pesticides[27]. This is also in line with what was expressed by the participants through a directed discussion (July, 2020): "I use pesticides to protect my land and crops" (Participant 1, July 2020). The methods that can be used by participants in applying the use of pesticides vary, but the method chosen by participants is spraying. This method of spraying is carried out only in the morning and evening; however, it adapts to the type of plant.

The selection of spraying method was chosen because it adapted to the type of plant harvested by the participants. In addition, choosing a method for selecting the type of pesticide is also important. The choice of pesticide use adjusts the type of plant and the state of the land because pesticides are divided into several types, such as herbicides, insecticides, fungicides, plant growth regulators, and many others[27]. The types and examples of chemical pesticides used by the participants, as, for herbicides, they use Curakron and Demolis which function to eradicate pests; then the second fungicides are such as Antracol, Ditan, and Mankosep which function to inhibit, kill and protect against fungal diseases; and the third uses plant growth regulators, for example using antonic which functions as a stimulating agent for plant growth and can multiply yield growth harvest.

The choice of the type of chemical pesticide used by participants has several advantages, one of which is for protecting the crop from pests, fungi, and diseases. When the harvest can be protected, it can produce a bountiful harvest and have good quality. So that farmers can earn a profitable income due to reduced damaged yields. From the advantages discussed above, farmers often socialize when resting in the field.

"We often have a conversation about this, but yes it's the same when we rest, for example, someone brings tea or coffee in the hut, yes, it's the other farmers. Usually, we often chat regularly or discuss the use of pesticides to overcome pests, such as the type or brand. Then usually we like to discuss how to eradicate the problems that are happening in our field. We are always open about the use of pesticides we use" (Participant July 2, 2020).

As the participant said in the quote above, they often discuss the types and brands of pesticides to overcome pests, fungi, and diseases of plants. There are often discussions about the grievances experienced by farmers in caring for and protecting their land, as well as how to eradicate and deal with pests, fungi, and diseases that occur in their respective fields. This is what makes healthy competition arise in using pesticides. This healthy competition is carried out to avoid pests or diseases that come from the next land into other farmers' land. The definition of competition is quoted from a directed discussion with participants:

"For example, this mother uses pesticides for snake pests, yes, I also if the land is next to her, yes, I also have to use the pesticide so that the pests in the father's land do not enter my land" (Participant 4, July 2020).

The emergence of this healthy competition is because farmers are competing with each other in using pesticides so that their land is protected. But if this competition in the use of chemicals in the farming process is excessive and even carried out continuously, this can have a negative impact on the environment and consumers. Negative things are caused such as damage to the ecosystem due to environmental pollution, accidentally killing microorganisms that are actually beneficial to plants, and can leave residues on crop yields that have a negative impact on health[28]. This was also revealed by one of the participants:

"I know that the use of these chemical pesticides can have a negative impact on the environment because often the residue is left on vegetables or fruits. But if only my land does not use pesticides later, even pests and diseases from the next land can attack my land, so I must still consider the use of pesticides" (Participant 1, April 2021).

Even though participants knew the negative impact of pesticide use, they continued to use pesticides with the demands of competition between farmers and the demands of consumers. The method of pesticide used by participants is the spray method, the method

was chosen for the sustainability of future generations. When compared to the SFS theory on the sustainability component, this is different, because the SFS mentions environmental sustainability means not using chemicals because it prioritizes biodiversity, health, and toxicity. In addition to the environmental sustainability component, participants have also implemented social sustainability, such as maintaining close relationships between farmers by helping each other and sharing information related to dealing with problems in the fields. If you look at it, these two things actually have the same purpose as SFS even though the method of application is different.

CONCLUSIONS

This research showed that participants have actually run a Sustainable Food System (SFS) with their views. Participants digested the SFS theory by applying a comparison of the use of more organic fertilizers compared to chemical fertilizers, using the intercropping method so as not to use too much chemical fertilizers, and the use of pesticides with less dose and using the spray method. The reason why participants still use pesticides and mixed fertilizers is that there are demands that must be met, such as consumers who require participants to produce more crops, competition between farmers in the use of pesticides, the state of less fertile soil, and also economic demands. Although the participants' perspectives on SFS theory are different, these two things have the same goal of providing sustainability for future generations. So from the different ways of applying this SFS theory, what impact will the next generation feel?

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CONFLICT OF INTEREST

All the authors have no conflict of interest in this study

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