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APPLICATION OF ORGANIC CULTIVATION TO MAINTAIN THE HARMONY OF NATURE AND FOOD SAFETY

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ABSTRACT

Modernization has an impact on increasing public literacy about the importance of food products that are safer for health. In addition, the society has also been aware of the dangers of pesticides and other chemical products used in agricultural businesses that can pollute the environment and disturb the balance of nature. Writing this review aims to describe the positive impact of organic farming on natural balance and food security and to formulate policy recommendations that can be made to expand the range of application of organic farming methods. From the various journals that have been reviewed, the results show that organic farming requires lower inputs and energy than conventional farming. In addition, the diversity of organisms in organic cultivation systems is also more abundant, so that the impact will be more positive for maintaining the balance of nature. The application of organic cultivation systems has also been proven to produce food products that are safer for consumption and more economically profitable for farmers. Therefore, efforts to implement an organic crop cultivation system are important to be carried out with the support of all component of society.

Keywords: *food safety, natural balance, organic*

BACKGROUND

Along with the times and easy access to information, the level of public literacy about health is increasing. This has led to an increase in the tendency of people to adopt a healthy lifestyle. Especially among consumers who come from developed countries such as Europe, America and Japan who think that organic agricultural products are superior in terms of nutrition, safety and health. This behavior also influences consumer choices in developing countries such as Indonesia, especially for people who live in cities. This is supported by research conducted by Titus & Hubeis (2016) on 100 students from IPB University, the results of the study indicate that there is a positive influence on perceived values about organic food and health awareness towards the desire to buy organic food products which are considered safer and better for health.

So far, it has been known that the use of chemical pesticides is bad for the environment and disturbs the balance of nature. One of the effects is that it can kill various kinds of organisms in nature

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so that they become extinct. This has been widely discussed by environmental activists, one of the most famous is Rachel Carson with her novel entitled *Silent Spring*. Besides pesticides, the continuous use of chemical fertilizers also has a negative impact on agricultural land because it causes the soil structure to become hard, making it more difficult to cultivate. In addition, the use of chemical fertilizers is burdensome for farmers economically because these materials are not easy to obtain in nature. Excessive use of inorganic chemicals has a negative impact on land and plants. In the community there is anxiety about the high content of pesticide residues in agricultural products (Yuriansyah et al., 2020). Chemical inputs in farming can cause a decrease in soil fertility, pest resistance, water pollution, and risks to human and animal health due to pesticide residues in fresh food products of plant origin that are consumed.

According to Suryaminarsih *et al* (2017), apart from having an impact on environmental damage, pesticide residues are also harmful to health, both in the long and short term. One of them is inhibiting cognitive development. During pregnancy there is a risk of congenital abnormalities. These pesticide residues can be found in fresh fruits and vegetables, so we need to be careful when consuming them. The use of pesticides can occur during the production process in the field or during post-harvest. Therefore, it is necessary to reform the method of cultivating plants that are more environmentally friendly and the results are safer for human and animal consumption. According to Yuriansyah et al. (2020), it is necessary to develop alternative agricultural systems that are able to produce healthy quantity and quality products in a sustainable manner. One of the agricultural systems that support this concept is the organic farming system. The purpose of writing this review is to describe the positive impact of organic farming on natural balance and food security and to formulate policy recommendations that can be implemented to expand the range of application of organic farming methods.

RESEARCH METHODS

This research uses a literature study method with a qualitative approach. The data source used in this study is secondary data which is described in the form of discussion, so that a structured and directed understanding can be found.

RESULT AND DISCUSSION

Principles of Organic Agriculture

In general, agricultural systems are called organic farming when the food production process is carried out naturally, does not rely on chemical fertilizers and pesticides, artificial hormones, antibiotics (often used in animal husbandry) and do not use Genetically Modified Organisms (GMOs). Herawati et al. (2014) said that Organic farming is a way of farming that does not use chemicals as fertilizers and pesticides. The fertilizer used is usually a combination of animal manure, compost from plants and volcanic ash. The pesticides used also come from various plants that are known to be disliked by pests. In this way, what comes from the soil is returned to the soil so that the environment sustainability is maintained and the quality of the plants produced is better.

Therefore, according to Herawati et al. (2014), organic farming activities will be closely related to other agricultural activities, for example making compost (from plant waste) and animal

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husbandry (which not only produce meat or other livestock products, but livestock waste is used as compost). Organic farming activities consist of several integrated agricultural activities. Organic farming also usually relies on a multicultural system, at the same time, various types of plants are planted on a plot of land. Apart from aiming to ensure a continuous supply of organic products, a multicultural system will reduce the risk of pest attacks and is considered more environmentally friendly because it ensures more biodiversity.

The cornerstones of organic production systems are balanced crop rotation with legumes, recycling of embedded nutrients (through mixed farming), and use of organic fertilizers. The use of synthetic fertilizers and chemical pesticides is prohibited. In livestock production, animals must be fed with organic feed, cultivated from the same farm, and provided with sufficient space and access to outdoor areas. Compliance with organic standards is verified annually through farm inspections conducted by accredited certification agents (Seufert et al., 2017).

According to Yuriansyah et al. (2020), The basic principles that must be carried out in the management of organic agriculture include (1) Maintaining healthy ecosystems through (a) optimizing the use of natural resources, (b) maximizing the use of environmentally friendly materials, (c) increasing ecosystem diversity; (d) crop rotation. (2) Application of efficiency principles in cultivation systems such as (a) minimum tillage (minimum soil processing), and (b) reducing the use of raw materials from outside the ecosystem (low external input), (3) Carrying out production activities with the concept of sustainable agriculture, (4) Producing pesticide-free products, (5) Carrying out production activities based on the results of agro-ecosystem analysis and in accordance with market demand, and (6) Preserving the environment.

Natural Balance and Food Safety

According to Cannon Webster Dictionary, the definition of natural balance is a state of balance in nature due to the constant interaction of all biotic complexes and the environment. While in accordance with the site dictionary.com, the definition of natural balance is the existence of a balance between organisms and their environmental populations resulting from continuous interaction and interdependence. Therefore, it can be concluded that the notion of natural balance is a stable state in which natural communities of animals and plants exist, maintained by adaptation, competition and other interactions between community members and their non-living environment.

Hermanu (2014) reveal that the notion of food safety is the conditions and efforts needed to prevent food from possible biological, chemical and other contaminants that can interfere with, harm and endanger human health. Meanwhile, pursuant to Mamuaja (2016), safe food is food that is free from harmful components or organisms that can cause poisoning or cause disease. Healthy and safe food is an important factor to improve public health status. Therefore, the quality and safety of food biologically, chemically and physically must always be maintained, so that people as users of these food products can avoid food-borne illness and/or food poisoning. The guarantee of safe food is very important for human health. Therefore, there are institutions established by the government of each country in order to monitor and ensure that food in circulation is safe for consumption by the public. In Indonesia, several institutions tasked with handling this matter include: (1) the Food and Drug Monitoring Agency (BPOM), (2) the Food Safety Competent Authority (OKKP) and the Ministry of Health.

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The Impact of Organic Cultivation on Natural Balance and Biodiversity

About 25% of anthropogenic greenhouse gas (GHG) emissions are caused by food production. Carbon dioxide (CO2), methane (CH4), and nitric oxide (N2O) increases during the burning of fossil fuels (for the production of chemical fertilizers and the use of agricultural machinery). Research conducted by Meemken & Qaim (2018) show that organic farming uses less energy per unit of land, and to a lesser extent, also per unit of output than conventional farming. This difference is primarily due to the non-use of synthetic fertilizers and pesticides in organic systems. Use of fossil fuels for activities farming is also lower in organic farming systems.

Mismanagement of agricultural land results in millions of hectares of previously fertile land becoming unsuitable for agricultural production due to soil degradation (erosion). Research conducted by Meemken & Qaim (2018) states that the meta-analysis and results of long-term field trials proves that organically managed land has a higher organic matter content, besides that the soil microbial community is also more active. Both of these are the main indicators of soil quality. This study also states that the diversity and number of species of organisms is significantly higher in organic farming than in conventional farming.

Organic cultivation systems also have a positive impact on biodiversity. This is evidenced by research on the diversity of endophytic fungi in water spinach plants on organic and conventional farms conducted by Ariyono et al. (2014). The index value of endophytic fungus diversity in water spinach leaves in organic land was higher than in conventional land. This shows that the process of cultivating plants organically has an effect on maintaining the diversity of endophytic fungi. In addition, this study also showed that the domination index value of the endophytic fungus of water spinach leaves in conventional land was higher than in organic land. This shows that the condition of diversity in leaf tissue in organic land is better than in conventional land because in organic land there is no dominance of one species.

Similar results were also obtained by Pradhana et al. (2014) who conducted research on the diversity of insects and spiders in organic and conventional rice cultivation. The number of insects and spiders found in organic land is greater than in conventional land. Beside that, organic land has a higher diversity index value of insects and spiders compared to conventional land. The existence of spiders has an important role in agriculture because it can function as a predator of plant pests.

Impact of Organic Cultivation on Food Safety

Along with the times and the ease of accessing information about health, public awareness of the importance of food safety has also increased. People become smarter and know about the benefits and uses of an item, such as the presence of organic food (Hidayanti et al., 2021). According to Rafikasari (2018), based on survey data released at the end of 2016 by Nielsen's New Global Health and Ingredient-Sentiment Survey regarding the diet of modern society in Indonesia shows that 70% of respondents admit to following a certain diet to avoid various degenerative diseases and 68% of respondents invest more in foods with ingredients that suit their diet. One type of product that is in demand by people who are trying to live a healthy lifestyle is organic products. This is supported by research conducted by Suharjo & Harianto (2019), the Baby Boomers, X and Y generations show a positive attitude towards organic food. The majority of respondents from each generation show an interest in repurchasing organic food even though organic food is felt to be more expensive than conventional food.

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Conventionally cultivated plants generally use chemical pesticides as an effort to control pests. Yet according to Suryaminarsih (2017), food ingredients containing pesticide residues are unsafe and have a negative impact on health, because they can cause infertility, hormonal changes, diabetes, cancer, autism, obesity, even Parkinson's.

In general, foodstuffs derived from plants are safer if cultivated organically. This is proven by research conducted by Barański et al. (2014), who conducted a meta-analysis based on 343 peer-reviewed publications showing statistically significant differences in composition between foods of organic and non-organic plant origin. Organic crops had on average higher antioxidant concentrations, lower Cd concentrations and lower incidence of pesticide residues than non-organic controls across all production regions and seasons studied. Moreover, a study conducted in France by Kesse-Guyot et al. (2013) showed that regular consumption of organic food is associated with lower rates of obesity.

The Impact of Organic Cultivation on Farmers' Socio-Economy

Today, consumers are increasingly concerned about the impact of food on health and the environment. This can be an opportunity to increase the economy for farmers because consumers are willing to pay more for organic products. According to Funk & Kennedy (2016), the increase in demand is mainly due to consumer concerns about the negative implications of conventional farming for human health and the environment. Especially in developed countries, most consumers consider organic food to be safer and healthier than conventionally produced food.

Economically, the costs incurred by farmers who apply organic cultivation systems will be less. This is because the source of nutrients comes from organic materials owned by farmers such as plant biomass, livestock manure, and other agricultural waste. This is supported by research conducted by Wonga & Sutiknjo (2021) which shows that the average farming costs incurred by organic rice farmers are smaller than non-organic rice farmers. In addition, the income earned by organic rice farmers is greater than the income received by non-organic rice farmers.

The results of research conducted by Herawati et al. (2014) also showed the same thing, the productivity of organic lowland rice was higher than the average productivity of rice in general in Tasikmalaya Regency. This shows that organic rice farming is more profitable than conventional rice farming. In addition, this study also shows that organic farming systems are more cost-effective in terms of agricultural production inputs such as fertilizers and pesticides compared to conventional farming, because most farmers make the natural fertilizers and pesticides they use themselves, while the chemical fertilizers and pesticides used in agriculture Conventional products are industrial products that must be purchased. This is also supported by research conducted Hardiyanti et al. (2022), the use of production inputs for phonska fertilizer and labor is not economically efficient, so the use of these production inputs needs to be reduced.

Positive Impact of Implementing Organic Cultivation Systems

An organic farming system is a method of cultivating plants that has the principle of returning organic matter to the soil (in the form of by-products/organic waste from agricultural activities, animal husbandry, fisheries) and avoiding the use of inputs from chemical/synthetic materials. Efforts on this system aim to improve the health of soil, plants, animals, and humans. The organic farming system also aims to maintain the balance of nature and establish the principles of justice to be able to

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live together (between humans, animals, plants and microorganisms). In addition, this system also aims to improve the economic level of farmers and protect them from the risk of excessive exposure to chemicals.

Agricultural cultivation carried out with an organic system does not use chemical fertilizers, but the fertilizers given come from organic materials. When compared to chemical fertilizers which only contain certain (specific) nutrients, organic fertilizers provide the macro and micro nutrients needed by plants. In addition, the use of organic fertilizers also has a positive impact on the abundance of beneficial organisms such as earthworms. The existence of soil fauna can increase fertility and improve soil structure.

Eliminating the use of chemicals in organic farming has a positive impact on the environment because it can minimize sources of chemical contamination resulting from agricultural businesses. In addition, the resulting agricultural products are also safer for consumption because they do not contain residues from fertilizers and pesticides. According to Yuriansyah et al. (2020), the various positive benefits of implementing an organic farming system have caused the trend of consuming organic products in the restaurant, hotel, restaurant and catering business sector to increase every year. Meanwhile, pursuant to the Indonesian Organic Alliance (2016), the level of consumption of organic products in several regions is also reported to be increasing. The research shows that public awareness of healthy food ingredients is increasing. Sutarni et al. (2018) said that organic consumers generally do not mind higher product prices compared to non-organic products. Availability of supply of organic products is still very limited and information about these products is still very minimal. Many people still find it difficult to find the organic products they need.

Yuriansyah et al. (2020) said that the organic farming system requires ecological stability to ensure the life of all components in a balanced and sustainable manner. Economic stability guarantees the fulfillment of the needs and sustainability of the farming business being developed, social stability to ensure consistency and stability of businesses based on organic patterns, and concept stability that is able to convince related parties to provide strong support for the development of organic agriculture. The harmonization that is created will create a mutually beneficial and sustainable relationship of mutualism.

Policy Advice related to the Implementation of Organic Cultivation Systems

From previous studies, it is known that organic farming systems have many positive impacts on the balance of nature and biodiversity. Organic farming uses less energy and external inputs thereby minimizing chemical pollution to the environment. Cultivation of plants using organic systems can also prevent land degradation and increase biodiversity. Fresh food products of plant origin that are cultivated organically are also proven to be safer for consumption, thus reducing the risk of developing degenerative diseases. Moreover, farming with an organic system is also more profitable for farmers because with lower production costs, product selling prices can be higher than conventional products.

Therefore, it is suggested that there is an active role from all parties to support the organic farming system in Indonesia. The Indonesian government already has regulations, namely Permentan No. 64 of 2013 concerning Organic Farming Systems. In addition, the National Standardization Body in 2016 has also compiled SNI on Organic Agriculture Systems (SNI 6729:2016). However, mere regulation is not enough. Implementation needs to be done to promote the application of organic

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farming systems among farmers. Promotion of organic cultivation systems should be carried out on all fronts, starting from the ministry to the agricultural service in provinces, districts, and cities.

The role of health workers is also very important to make people aware of the dangers of pesticide residues and other chemical contamination that enter the body. If people's awareness about health increases, there is hoped that they will switch from conventional products to healthier organic products. The role of academics working in agriculture on campus is also very important, because they play a role in educating and transmitting organic farming knowledge to students. It is hoped that after graduation they can put their knowledge into practice and continue the baton to preserve organic farming systems.

So far, one of the obstacles farmers face in carrying out organic certification is the high cost that must be paid to privately owned Organic Certification Institutions. Therefore, the existence of a government-owned Organic Certification Institutions is very important so that organic certification costs become more affordable. In addition, there is a need for community support as consumers by buying products that are labeled organic.

CONCLUSION AND SUGGESTION

From the results of writing this review, it is concluded that organic farming has many positive impacts on the balance of nature, including reducing the risk of land degradation, increasing soil fertility, enriching biodiversity, and minimizing environmental pollution due to agricultural activities. In addition, organic products also have a higher antioxidant content and lower contamination of pesticide residues and heavy metals, so they are safe for consumption. However, the implementation of the organic farming system in Indonesia is still not optimal, so support from various parties such as the government, health workers, academics, farmers and consumers is needed so that the optimization of the organic farming system in Indonesia can be realized.

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