



## Benefits of Using Organic Fertilizer for Soil Fertility

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### Abstract

This paper aims to determine: 1) the Benefits of using organic fertilizers for soil fertility, and 2) Knowing about soil productivity as a medium for supporting plant growth. The research method qualitative approach, which is a scientific approach that produces descriptive data in the form of written words from the narratives of the sources or objects under study. The result of this research is that in the current era of globalization, organic is very important for the development of people who want to live healthily and without damaging the surrounding environment by utilizing natural materials or the remnants of kitchen waste. So, farmers are expected to be more aware and creative in the use of organic fertilizers and it is hoped that farmers' income will also increase.

**Keywords** Benefits, Organic Fertilizer, Soil Fertility

### INTRODUCTION

Organic farming has long been known by humans, namely since the science of farming was applied by our ancestors. At that time everything was done in the traditional way and using natural materials. In line with the development of agricultural science and the human population, the need for food also increases. The green revolution in Indonesia gave significant results to the fulfillment of food needs (Manurung et al., 2021). The use of synthetic fertilizers, planting of high-yielding varieties, the use of pesticides, and intensification of land have increased. However, with the development of the times, lately, many problems have been found due to mismanagement of agricultural land, namely pollution by chemical fertilizers and chemical pesticides due to excessive use of these materials and the impact on environmental quality and human health due to contamination of these synthetic materials (Yamani, 2010).

Indonesia is known as an agricultural country because about 70% of its population lives in rural areas. This condition causes the role of the agricultural sector to become the mainstay of the livelihood of the Indonesian population. The contribution of the agricultural sector to Gross Domestic Product (GDP) is predicted to continue to decline in the future. This must be prevented by increasing agricultural production both in quality and quantity (Firmansyah et al., n.d.).

A healthy lifestyle with the slogan "Back to nature" has become a new life for the world community. Many people are aware of the negative effects of the use of chemicals, such as synthetic chemical fertilizers and pesticides, and growth hormones in agricultural production on human health and the environment. As a country that is blessed with abundant biodiversity, an abundance of sunlight, water, and soil, as well as a community culture that respects nature. So Indonesia has a very large basic capital to develop organic agriculture because it is not excessive if the selling value to be achieved in the development of organic agriculture is higher than that of inorganic agriculture. If it is associated with the task of



providing sufficient, quality, and sustainable food for the community, the development of organic agriculture is one of the right choices in supporting local food security (Suharta, 2010).

In relation to the problem of agricultural development, Indonesia has sought to change the orientation of the agricultural system, namely from a traditional agricultural system to a modern agricultural system. This problem is related to the role of fertilizer in farming activities which is very important (Roidah, 2013). The scarcity of fertilizers and the increase in fertilizer prices will burden farmers as expenses for production facilities in farming so that farmers can carry out alternative farming practices by making bokashi fertilizer which focuses on the use of inputs from within the farm in building soil fertility. This is marked by its development as an agricultural business using organic fertilizers with the aim of maintaining soil fertility in order to increase food demand, sustainable productivity, and increase farm income (Surya Zannah Hasibuan, 2015).

From this description, it can be understood that when we talk about agribusiness, we cannot escape the role of farmers in meeting the need for healthy food without damaging the agricultural environment itself. This paper discusses the importance of the benefits of organic fertilizers for soil fertility.

## LITERATURE REVIEW

### Organic fertilizer

Efforts are being made to improve soil fertility by fertilizing using organic fertilizers. The nutrient content in manure is not too high, but this type of fertilizer has other properties, namely, it can improve soil physical properties such as soil permeability, soil porosity, soil structure, water holding capacity, and soil cations (Primadani, n.d.).

#### 1. Manure

In general, each ton of manure contains 5 kg N, 3 kg P<sub>2</sub>O<sub>5</sub>, and 5 kg K<sub>2</sub>O as well as other essential nutrients in relatively small amounts (Hardjowigeno, 2003). The properties of manure are as follows:

- Chicken manure contains three times more N than manure
- Goat dung contains N and K, each twice as large as cow dung.
- Pig dung contains twice as much P as cow dung.
- Manure from horses or goats ferments and heats up more quickly than manure from cows and pigs. Therefore, many farmers refer to cow and pig manure as cold manure (cold manure).
- In all manure, P is always present in solid manure, while most of K and N are in liquid manure (urine).
- The K content in urine is five times more than in solid feces, while the N content is two to three times more.
- The nutrient content in chicken manure is the highest because the liquid part (urine) is mixed with the solid part. The nutrient content in manure is determined by the type of food given. The nutrient content and various decaying manure are presented in table 1.



**Table 1. Nutrients in manure in percent (%)**

Cattle	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Chicken	1,70	1,90	1,50
Cow	0,29	0,17	0,35
Horse	0,44	0,17	0,35
Pig	0,60	0,41	0,13
Sheep	0,55	0,31	0,15

## 2. Green Manure

Green manure is defined as young forage and can be used as an addition to N and other elements or plant residues that are returned to the soil. The green manure can be used as a substitute for manure if the amount of manure is small while the soil really needs organic fertilizer (Rijaldi, n.d.). Green manure plants must meet the following requirements:

- Fast-growing and produces a lot of forage material.
- Succulent, not much wood.
- Contains a lot of N.
- Drought resistant.
- If it is an intercrop, the type that does not propagate is selected.

Examples of plants that are grown and can be used as green manure include:

- Snore (*Crotalaria* sp), herbaceous plant aged 2-4 months.
- Lamtoro, turi as well as a protective plant.
- Calopogonium, Sentrosema, Mimosa, shrubs that are often used as ground cover plants.

## 3. Compost

Compost is organic material that is decomposed in a place that is protected from the sun and rain, the humidity is regulated by pouring water when it is too dry. To speed up the renovation, lime can be added to form compost with a low C/N ratio that is ready for use (Rosniawaty, 2021).

Organic materials referred to in the definition of compost are grass, straw, remnants of twigs and branches, animal manure, fallen flowers, the urine of livestock, and other organic materials. All of these organic materials will experience weathering caused by microorganisms that thrive in moist and wet environments (Wijanarko et al., 2012).

Basically, this weathering process is a natural process that usually occurs in nature. However, this natural weathering process takes place over a very long period of time, even decades. To shorten the weathering process, human assistance is needed. If the composting process is done properly, the process only lasts for 1-3 months, not years.



The use of compost is very good for soil and plants. Compost can provide micronutrients for plants. Its use can simultaneously loosen barren soil, and increase porosity, aeration, and the composition of microorganisms in the soil.

Compost is also useful for increasing the binding capacity of the soil to water so that it can store groundwater longer. The availability of water in the soil can prevent the dry layer of the soil. The use of compost is useful for maintaining root health and making plant roots easy to grow (Moto, 2019).

The nutrient content in compost is indeed less than inorganic fertilizers. Therefore, its use must be carried out in large volumes to meet plant nutrient needs. However, judging from the advantages that compost can provide for soil and plants, it doesn't hurt to have to use it even if it has to be in large volumes.

The benefits that compost provides are not only for now but for the long term for decades to come. Currently, many people have started to switch to using organic fertilizers, one of which is compost. Because it uses organic materials that are considered waste, the price of compost is also relatively cheap.

## **RESEARCH METHODS**

This study uses a qualitative approach, which is a scientific approach that produces descriptive data in the form of written words from the narratives of the sources or objects under study.

The source of the data referred to in this study is the subject where the data can be obtained. This data is information that is needed to analyze and draw a conclusion from the research.

Meanwhile, the research subjects, in particular, are the parties who are the focus of the target, such as the Chair of the Farmer's Group, the Facilitator of the Farmer's Group, Members of the Farmer's Group, users of organic fertilizer produced by the farmer group, as well as the community related to the research focus.

## **RESULT AND DISCUSSION**

### **Soil That Needs a Lot of Organic Fertilizer**

Very poor soils should be fertilized with organic fertilizers. Sandy soil or soil that is heavily eroded is better fertilized with organic fertilizers than with artificial fertilizers because the application of artificial fertilizers on the soil will be easily washed off by rainwater. By giving manure, the ability to hold water and soil cations increases, so that if artificial fertilizers are also given, leaching by rainwater and erosion can be inhibited (Hartatik, n.d.).

Efforts to maintain soil organic matter content to reach ideal conditions (5% on dusty clay soil) is a good action, environmentally friendly, and thinking for its sustainability. The influence of organic matter in agriculture has become important after many people value environmentally friendly agricultural products (organic agriculture) or are often declared back to nature (back to nature).



The addition of organic matter to the soil has a stronger effect on improving soil properties and is not specifically for increasing nutrients in the soil. For example, Urea has an N content of 46%, while the organic matter has an N content of < 3%, so there is a very large difference in the levels of N elements. However, Urea only contributes 1 nutrient, namely N, while organic matter provides almost all the elements needed by plants in a relatively balanced ratio, although the levels are very small. So that in the long term soil management or sustainable farming, it is very good to pay attention to and maintain soil organic matter levels (Dewanti et al., 2021).

The use of organic matter in the soil must pay attention to the ratio of the levels of element C to nutrients (N, P, K, etc.) because if the ratio is very large it can cause immobilization. Immobilization is the process of reducing the amount of nutrient content (N, P, K, etc.) in the soil by microbial activity so that the levels of these nutrients that can be used by plants are reduced.

### **Advantages and Disadvantages of Organic Farming System**

The advantages of organic farming for farmers are as follows:

- By implementing an organic farming system, the soil balance can be maintained because it does not use chemical fertilizers and pesticides, but uses organic fertilizers such as manure, green manure and crop residues.
- By avoiding excessive use of pesticides, it will reduce the risk of poisoning these substances so that people can consume healthy foods.
- Increasing public awareness will ensure the health of agricultural products which will increase the amount to be paid for these commodities so as to improve the welfare of farmers.
- Without the use of fertilizers and pesticides can save operational costs. In addition, organic soil processing, such as minimum tillage can also reduce operational costs.

While the weaknesses of the organic farming system are as follows:

- Requires complex land management.
- At the beginning of the implementation of the organic farming system, many problems were often encountered that made farmers despair.
- It takes a long time to get maximum results because it has to go through the conversion stage first.
- If applied to a large business scale, it will cost a lot, especially labor costs when the environmental ecosystem has not been developed.

### **Benefits and Goals of Organic Farming**

The benefits of an organic farming system are as follows:

- Increase farmers' income.
- Reducing all forms of pollution resulting from various agricultural activities.



- Producing food that is safe, and nutritious, so that it can improve public health as well as the competitiveness of agribusiness production.
- Creating a healthy and safe environment for farmers.
- Increase and maintain the productivity of agricultural land in the long term and preserve natural resources (SDA) and the environment.
- Creating job opportunities and new innovations in maintaining social harmony in rural areas.

IFOAM (International Federation Of Organic Agriculture Movement) stated the goals of organic farming system are as follows:

- Produce food with high nutritional quality in sufficient quantities.
- Carry out effective interactions with natural systems and cycles that support all existing forms of life.
- Encourage and increase recycling in farming systems by activating the life of micro-organisms, flora, and fauna.
- Maintain and improve soil fertility in a sustainable manner.
- Limit the occurrence of environmental pollution by agricultural activities.
- Maintaining biodiversity including preservation of plant and animal habitats.

### Soil Productivity and Fertility

The definition of soil productivity and soil fertility to describe the ability of soil as a medium for supporting plant growth is often used in a vague way. Soil productivity is the ability of a soil to produce certain products of a plant under a certain management system. A land or land can produce good and profitable plant products as productive soil. Soil productivity is a manifestation of all factors (soil and non-soil) that affect crop yields.

Soil productivity is a description of the ability of the soil based on economic considerations and not only on soil properties. Three factors that affect soil productivity are input (management system), output (plant yield), and soil. Soil can be said to be productive must-have fertility that is favorable for plant growth. However, fertile land does not always mean productive. Fertile soil will be productive if it is managed properly, using appropriate management techniques and plant types. Soil productivity is not always the same as soil fertility (Lestari & Tanah, n.d.).

Soil fertility is the ability or quality of a soil to provide plant nutrients in sufficient quantities to meet plant needs, in the form of compounds that can be utilized by plants, and in an appropriate balance for certain plant growth if temperature and other growth factors support growth. normal plant. Soil fertility includes 3 aspects, namely:

- Quantity includes the amount or concentration and kinds of nutrients needed by plants.
- Quality is the ratio of the concentration of one nutrient to another.
- Time is the availability of these nutrients continuously according to the needs of the plant during its growth, namely from germination to harvest.



**The Effect of Fertilization on Soil Fertility**

The balanced use of fertilizers will increase crop production. Increased production also increases the number of plant residues (leaves, stems, roots) that are left behind or that can be returned to the soil. A nutrient balance of about 80% return of plant residues can enrich nutrient reserves, thereby reducing the need for nutrients that must be added. This treatment is carried out continuously will reduce nutrient requirements so that sufficient nutrient conditions will be achieved for the growth and production of tall plants without any input of fertilizer from outside. The return of plant residues will improve the chemical and physical properties of the soil, increase the ability to store water, and increase the ease of cultivation and soil fertility. The main reason that the soil can be very hard is the long-term use of a single inorganic fertilizer. For example, sulfate and carbonate residues contained in fertilizers and soil can react with soil calcium, making tillage difficult. The use of balanced fertilizers avoids soil hardness, thereby increasing plant growth and soil porosity, and available soil moisture content (Kalay et al., 2020).

The results of a national fertilization experiment in China show that the rational use of inorganic NPK fertilizers in the long term increases soil fertility, such as increasing organic matter levels, and N and P levels, especially in poor soils. Table 2 shows that soil organic matter content increased in different cultivation systems after long-term use of fertilizers (10 years), for both organic and inorganic fertilizer sources.

**Table 2. Effect of long-term fertilizer use on soil organic matter content in different planting systems.**

Plant	Years	No Fertilizer	NPK	Manure	NPK+Cage Fertilizer
Lowland rice (n=4)	1981	2,64	2,64	-	2,64
	1990	2,50	2,63	-	3,11
rice field polowijo rice (n=7)	1981	2,25	2,25	2,25	2,25
	1990	2,13	2,33	2,38	2,43
2x harvest on dry land (n=7)	1981	1,41	1,38	1,26	1,27
	1990	1,32	1,49	1,45	1,46
1x harvest on dry land (n=5)	1981	1,92	1,93	1,85	1,14
	1990	1,84	1,99	2,04	2,13

n= number of plantings in the field

**Organic Farming Opportunities**

According to Sutanto (2002), suggests that the opportunities for organic farming are as follows:

1. Increase in Biomass.



As the main source of organic inputs, it is only possible to implement it in areas that have quite high rainfall. However, there are also many obstacles in areas with relatively dry climates. The development of fast-growing tree species around the site can be used as a source to increase organic matter. However, the collection, processing, and utilization of biomass require the same view. Enriched Compost The basic ingredients for making compost are diversified using locally available materials. Methods that have been tested and improved, including EM technology and other technologies, are widely tested and promoted to improve compost quality.

2. Biofertilizers have been promoted and their production has been enlarged to provide wider opportunities for farmers to use biological fertilizers. It is better to develop biofertilizers based on the potential of microorganisms that exist in Indonesia. Meanwhile, biological fertilizers that must be imported need to be developed in Indonesia, including technology transfer.
3. Biological Pesticides. There are quite a lot of basic plant materials that can be used for plant protection, which at this time are still very limited in attention and use. This opens up greater opportunities for exploring the diversity of our biological resources to be developed into biological pesticides.
4. Traditional Technology Knowledge.

Although quite a lot of traditional technologies have been developed, especially in producing plants, protecting plants against pests and diseases, efforts are still needed to dig back traditional wisdom with scientific reviews and develop environmentally friendly technologies.

## CONCLUSSION

Limbah organik berasal dari sisa-sisa tanaman dan kotoran hewan yang dapat dijadikan pupuk organik yang mengandung unsur hara makro dan mikro dalam jumlah yang cukup untuk pertumbuhan tanaman, dimana dalam proses dekomposisi bahan organik tersebut diperlukan teknologi EM (Mikroorganisme Efektif) yang dapat mempercepat proses dekomposisi bahan organik.

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