

Application of Organic Farming Using Compost in the Cultivation of Purple Eggplant on Suboptimal Soil

Ermadani^{1*}, Heri Junedi¹, Suryanto¹, Itang Ahmad Mahbub¹, Yulfita Farni¹

Agroecotechnology Study Program, Faculty of Agriculture, University of Jambi, Jambi Indonesia

Correspondence author: *email: ermadani@unja.ac.id

ABSTRACT

Article history

Received
Revised
Accepted

Keywords Suboptimal soil, compost, purple eggplant

In Maro Sebo Village, the dominant soil type is classified as suboptimal soil, namely Ultisol, which has low fertility due to its low nutrient and organic matter content. Chemical fertilizers alone are not effective in addressing problems in suboptimal soils because they only supply nutrients but do not improve low soil pH and organic matter content. Therefore, organic fertilizers such as compost, which contain organic matter and nutrients, are required. The objective of this community service activity was to improve the knowledge and skills of the community in producing compost fertilizer and applying it in organic farming, particularly in eggplant cultivation on suboptimal soil. Compost was made from a mixture of cow manure and rice straw, with phosphate rock and boiler ash or dolomite as additives. The characteristics of the suboptimal soil (Ultisol) showed a low soil pH of 4.83 (acidic), 1.16% organic C (low), 0.11% total N (low), 1.59 ppm available P (very low), and very low exchangeable bases (Ca, Mg, K, and Na) of 0.31, 0.13, 0.04, and 0.05 cmol/kg, respectively. The compost had a pH of 7.42–7.77 (neutral), 0.91–0.95% total N, 4.23–4.75% total P, 12.65–19.77% total Ca, and 4.13% total Mg. The high P, Ca, and Mg contents were derived from the addition of natural phosphate rock, boiler ash, and dolomite. Eggplant growth with compost application showed optimal performance, producing 6 fruits per plant with an average fruit weight of 321.7 grams per plant. Participants' knowledge and skills also increased, as indicated by an improvement in average scores from 48 (pre-test) to 73.26 (post-test). This community service activity successfully enhanced community knowledge and skills in compost production and eggplant cultivation on suboptimal soil.

1. Introduction

The soil in Maro Sebo Village is classified as suboptimal soil. Suboptimal soils have low productivity levels [1]. One dominant type is Ultisol, characterized by low nutrient content, low pH, and low organic matter [2]. Chemical fertilizers are the primary source of nutrients commonly used to improve soil fertility. However, their long-term continuous use can lead to soil degradation and environmental pollution. The decline in soil pH, reduction in organic matter content, and decreased activity of beneficial microorganisms involved in organic matter decomposition and nutrient cycling occur due to chemical fertilizer application [3]. In addition, soil compaction and increased concentrations of heavy metals such as Cd, Pb, As, and Cu may result from prolonged chemical fertilizer use [4]. The continuously rising price of chemical fertilizers has also made them increasingly difficult for farmers to afford [5].

Efforts to reduce or replace chemical fertilizer use are therefore necessary. The use of organic fertilizers such as compost is one of the best alternatives. Compost materials such as cow manure and rice straw are easily obtained locally and can be produced at the village level. Compost contains 17.80% organic C, 0.85% N, 0.28% P, and 0.30% K [6]. Livestock and agricultural wastes are generally not well managed by the community. Cow manure is produced in large quantities and often left untreated, causing unpleasant odors during natural decomposition. Similarly, rice straw is usually piled at the edge of fields and allowed to decompose naturally. Cow manure has a pH of 6.72, 46.4% organic C, and 1.12% total N, while rice straw has a pH of 8.54, 43% organic C, and 1.06% total N [7]. If left untreated, these materials may take approximately

four months to decompose, leading to environmental odor issues. Composting is a controlled decomposition process of organic materials by regulating temperature, moisture, and aeration to produce compost [6].

Low organic matter and nutrient content are the main constraints of suboptimal soils, resulting in very low productivity [8] [7]. These soils require organic fertilizers to enhance productivity. The compost used in this community service activity contained organic matter and essential nutrients necessary to improve soil productivity. Purple eggplant (*Solanum melongena* L.) is one of the most popular vegetable crops among consumers. It is widely available in traditional markets and supermarkets. Purple eggplant is nutritionally rich; every 100 g of fresh eggplant contains 26 calories, 1 g protein, 0.2 g carbohydrates, 25 IU vitamin A, 0.04 g vitamin B, and 5 g vitamin C. It also has medicinal properties due to the presence of alkaloids, solanine, and solasodine [9]. Organic cultivation of eggplant using compost can produce healthy vegetables while simultaneously improving the productivity of suboptimal soils with low organic matter content.

Improving community knowledge, insight, and skills in managing suboptimal soils for vegetable cultivation must be achieved through community service activities. Utilizing locally available resources such as compost provides significant benefits to rural communities. Increasing public awareness of health and the nutritional benefits of vegetables also supports a more productive daily life and disease prevention. The objectives of this community service activity were (i) to apply compost production technology for improving the productivity of suboptimal soils for organic purple eggplant cultivation, and (ii) to enhance the knowledge, expertise, and skills of farmers/community members in applying organic farming through compost application in purple eggplant cultivation.

2. Method

Several stages were carried out in this community service program, including identifying and evaluating community conditions and the physical environment related to agricultural activities, particularly purple eggplant cultivation for daily vegetable needs; producing compost from locally available livestock waste (cow manure) and agricultural waste (rice straw); and applying compost as a soil ameliorant to improve the productivity of suboptimal soils in purple eggplant production. Additional activities included counseling and training on the implementation of organic farming using compost derived from cow manure and rice straw for vegetable cultivation, establishment of demonstration plots, crop maintenance, monitoring, and evaluation.

2.1. Observation

Observations were conducted to evaluate agricultural activities in Maro Sebo Village and assess soil conditions used for farming. Maro Sebo Village is located in Jambi Luar Kota District, Muaro Jambi Regency, Jambi Province.

2.2. Material Preparation

Based on field observations, materials prepared for the program included cow manure, rice straw, polybags, soil samples, and purple eggplant seeds. Cow manure was collected from local cattle farms, and rice straw was obtained from recently harvested paddy fields. The soil sample used was suboptimal soil classified as an Ultisol.

2.3. Implementation of Activities

The stages of implementation included site preparation for composting; preparation of compost materials (cow manure and rice straw); compost production; counselling on organic farming; training on compost production and purple eggplant cultivation; establishment of demonstration plots using compost as a soil ameliorant and nutrient source; and maintenance of eggplant crops until harvest.

2.4. Partner Participation

Participants involved in this community service activity were members of a farmer group supported by the Village Head and village officials. The Village Head and staff collaborated in providing a location for implementing the program in Maro Sebo Village. This activity was

expected to assist village authorities in improving community knowledge and skills in applying organic farming practices in purple eggplant cultivation using compost as a source of organic matter and soil nutrients in suboptimal Ultisol.

2.5. Activity Evaluation

Evaluation was conducted through a pre-test to assess farmers' knowledge of organic farming in purple eggplant cultivation. A post-test was conducted to measure the level of improvement in farmers' knowledge and understanding following the counselling and training activities.

3. Results and Discussion

3.1. Environmental Conditions of Maro Sebo Village

Maro Sebo Village is located in Jambi Luar Kota District, Muaro Jambi Regency, Jambi Province. The community generally cultivates plantation crops such as oil palm, rubber, coconut, and areca nut, as well as food crops, particularly lowland rice. In general, the people of Maro Sebo Village are not accustomed to growing vegetables, and vegetable consumption habits are relatively low. Residents appear less interested in cultivating vegetable crops, especially purple eggplant, so most vegetable needs are supplied from outside the village. This was confirmed by an initial survey conducted by the Community Service Implementation Team (PPM), which found that home yards were mostly planted with fruit crops such as banana, matoa, and mangosteen.

The soil in Maro Sebo Village is dominated by Ultisol. This soil type is classified as less fertile, with low pH, low organic carbon content, and low nutrient availability. As a suboptimal soil, Ultisol has the following characteristics: pH 4.83 (acidic), 1.16% organic C (low), 0.11% total N (low), 16.99% total P (very low), 25.93% total K (very low), 1.59 ppm available P (very low), and 0.04 cmol/kg exchangeable K (very low). Based on these characteristics, compost application in organic farming systems is essential to improve the productivity of suboptimal Ultisol soils. The use of compost is expected to enhance soil organic matter content and nutrient availability, thereby producing optimal and healthy purple eggplant yields without causing soil degradation such as declining organic matter content and soil compaction.

3.2. Implementation of Activities

The implementation of the program involved the Village Head, village officials, and women farmer groups. The community service team coordinated with the Village Head prior to conducting the activities (Figure 1). The activities were carried out collaboratively with village leaders, including the Village Head and village officials, as well as members of the Maro Sebo community (Figures 2, 3, and 4).



Figure 1. Discussion with the Village Head

3.3. Extension and Training Activities

Extension and training sessions were conducted on compost production, compost application in organic farming, and purple eggplant cultivation (Figures 2 and 3). Community members were also trained on the practical implementation of organic farming using compost derived from cow

manure and rice straw in purple eggplant cultivation. This community service activity enhanced farmers' knowledge and skills regarding compost production, the nutritional and health benefits of purple eggplant, and the application of compost in organic farming systems. The organic fertilizer in the form of compost was applied to suboptimal soil to evaluate its effectiveness in overcoming soil fertility constraints in marginal soils for purple eggplant vegetable production.



Figure 2. Extension and Discussion Activities



Figure 3. Compost Production Training Activity



Figure 4. Community and Student Involvement in Extension and Training Activities

Compost production was carried out by mixing the prepared compost materials. The materials used were cow manure, rice straw, boiler ash, and dolomite. The mixture ratio of cow manure to rice straw was 1:1 (volume : volume). After mixing, the organic materials were weighed. Boiler ash and dolomite were each added at 15% of the total weight of the organic compost mixture (Figure 5). The compost materials were turned weekly to ensure proper aeration and uniform mixing (Figure 6). The characteristics of the resulting compost are presented in Table 1.



Figure 5. Mixture of Compost Materials



Figure 6. Turning of Compost Materials



Figure 7. Mature Compost

Table 1 shows that the contents of P, Ca, and Mg in compost supplemented with natural phosphate rock, boiler ash, and dolomite are higher compared to compost made only from a mixture of rice straw and cow manure.

Table 1. Characteristics of Compost from a Mixture of Rice Straw, Cow Manure, Rock Phosphate, Boiler Ash, and Dolomite

Parameter	Unit	Compost		
		C1	C2	C3
		(cow dung + rice straw)	(cow dung: rice straw + 15% RP + 15% boiler ash)	(cow dung: rice straw + 15% BFA + 15% dolomite)
Value				
Moisture	%	42,52	46,68	43,6
N	%	1,09	0,95	0,92
P	%	0,69	4,75	4,23
K	%	1,17	1,13	0,96
Mg	%	0,55	0,85	4,13
Ca	%	2,78	12,65	16,86

The process of livestock waste (cow manure) and agricultural waste (rice straw) produces organic fertilizer in the form of compost. Compost is an organic fertilizer source that can be applied

to improve the productivity of suboptimal soils and purple eggplant yields in organic farming systems. Organic fertilizers are essential for increasing soil organic matter, which is a key factor influencing soil productivity [10].

Purple eggplant was planted in polybags, each filled with 10 kg of soil (Figure 8). The compost application rate was 30 tons/ha. With the application of compost, the eggplant plants grew vigorously and produced healthy, optimal fruits (Figures 9 and 10). Good growth of purple eggplant results in optimal fruit production (Figures 10, 11, and 12).

Compost is an organic fertilizer containing a complete range of nutrients. Compost contains both macronutrients (N, P, K, Ca, Mg, S) and micronutrients (Fe, Mn, Cu, and Zn) [11]. This comprehensive nutrient content makes compost an excellent alternative nutrient source for improving soil productivity and crop yields.

Purple eggplant is a vegetable highly valued for maintaining and improving health due to its nutrient content, including various vitamins such as A, B-complex, C, E, and K [9]. Additionally, purple eggplant has medicinal properties because it contains anthocyanin compounds, which are beneficial in managing and preventing various diseases, including diabetes, neurological disorders, cardiovascular diseases, and cancer [12].

Besides providing essential nutrients, compost application also increases soil organic matter, enhancing soil productivity [13]. Compost derived from agricultural waste also serves to return crop residues and organic matter back to the soil, contributing to soil fertility [7].



Figure 8. Preparation of Polybag for Growing Media and Plant Maintenance



Figure 9. Maintenance of Purple Eggplant Plants at 50 Days After Plant



Figure 10. Fruiting Purple Eggplant Plants



Figure 11. Purple Eggplant Fruit Harvesting



Figure 12. Purple Eggplant Fruit Harvest

The technology application involved the use of compost on suboptimal soil to improve soil fertility. Good soil fertility provides sufficient nutrients to meet the growth and production needs of purple eggplant plants. Optimal purple eggplant production can provide a source of healthy vegetables for the community and can also serve as an additional source of income [14]. Using organic fertilizer in the form of compost as a substitute for, or to reduce, chemical fertilizer use can also lower production costs, as chemical fertilizers are relatively expensive [15][16]. Compost is made from locally available livestock waste (cow manure) and agricultural waste (rice straw). By managing these wastes, the community can create useful products while simultaneously preventing environmental pollution.

3.4. Evaluation of Community Service Implementation

Farmers utilize various sources of information to gain knowledge and technology to manage their farming activities for optimal results. An effective relationship between agricultural researchers and extension activities is essential for agricultural development, as research results can be directly applied to the community [17]. Extension is a form of information dissemination regarding knowledge and technology, serving as a learning process that enables individuals to act as agents of change in social transformation [18]. Agricultural extension accompanied by the direct application of appropriate agricultural technology provides farmers with practical learning, allowing them to implement innovations directly in farming.

The community service activity was attended by 19 participants, out of 22 invited, resulting in an 86.36% participation rate. Evaluation of the extension and training activities showed an increase in the knowledge and skills of the participants (Table 2). The pre-test conducted before the activity showed an average score of 48, while the post-test after the extension and training activities showed an increase to 73.26, representing an improvement of 52.63%.

Table 2. Results of the Community Service Activity Evaluation

Grade	Pre Test	Post Test
Minimum	40	60
Maximum	52	80
Average	48	73,26

4. Conclusion

The outcomes achieved from this community service activity are: (1) a product in the form of compost fertilizer, (2) increased knowledge and skills of the community in managing livestock and agricultural waste into compost, and (3) the application of compost fertilizer in organic farming for the cultivation of purple eggplant vegetables.

To further enhance the implementation of organic vegetable farming in Maro Sebo Village, the involvement of relevant local government agencies in Muaro Jambi Regency is needed particularly the Agriculture Office, so that the community can produce vegetables independently, both at the household scale and commercially.

Acknowledgment

The implementation of this Community Service Activity was funded by the PNBP funds of the Faculty of Agriculture, Universitas Jambi, based on Decree Number 1723/UN21/PM/2025 and Agreement/Contract Number 709/UN21.11/PM.01/SPK/2025.

References

- [1] Yuliani, F., H. Hermawan, dan E. A. Suryana. 2024. Strategi optimalisasi lahan suboptimal dalam mendukung peningkatan produksi dan pencapaian ketahanan pangan. *Jurnal Agrica Ekstensial*. 18(2):57-71
- [2] Ermadani, Hermansah, Yulnafatmawita, A. Syarif dan I. Lenin. 2019. Use of organic waste as an alternative organic fertilizer and synthetic fertilizer to ameliorate acid soil productivity. *International Journal on Advanced Science, Engineering, Information*. 9(3):822-828.
- [3] Mahdhar, A., Ermadani, Aryunis. 2021. Effect of Biochar and Phosphate Fertilizer Application on the Growth and Yield of Soybean (*Glycine max* (L.) Merril) on Ultisol Soil. *J. Solum*, 18 (2): 45-65.
- [4] Massa, J. dan B. Azadegan,, 2016. Effect of chemical fertilizers on soil compaction and degradation. *agricultural mechanization in Asia, Africa, and Latin America* , 47(1):44 -50.
- [5] Khumaini, M.A. 2023. Rising Global Urea Prices Trigger Increased Profits for Pupuk Kujang. Tuesday, 4 Juli 2023. <https://www.antaranews.com/berita/3618636/increase-in-global-urea-prices>
- [6] Alwaneen. W.S. 2020. Effect of cow manure compost on chemical and microbiological soil properties in Saudi Arabia. *Pakistan Journal of Biological Sciences*. 23 (7): 940-945.
- [7] Cahyani, V.R., Rahayu, K. P. Lakshitarsari, R. A. Z. W.Megow dan N. Y. Azzahra. 2024. Composting of rice straw-based materials using aerobic bioactivator isolated from rice straw, mahogany bark and cassava peels. *Caraka Tani: Journal of Sustainable Agriculture*, 39(1), 48-64.
- [8] Ermadani, Hermansah, Yulnafatmawita dan A. Syarif. 2018. Dynamics of organic carbon and nutrients after organic waste addition in an acid soil. *Int. J.of Agric. Environmt. Biotech.*, 11(1): 55-64.
- [9] Kaushik, P., P. Gramazio, S. Vilanova, M.D. Raigón, J. Prohens, dan M. Plazas. 2017. Phenolics content, fruit flesh colour and browning in cultivated eggplant, wild relatives and interspecific hybrids and implications for fruit quality breeding. *Food Research International* 2017, 102, 392–401
- [10] Farni, Y., R. Suntari dan S. Priyono. 2022. Utilization of *Tithonia diversifolia* and sugarcane leaves to improve soil properties and plant growth on a sandy soil of Malang, East Java. *Journal of Degraded and Mining Lands Management.*, 9(2), 3227–3236.<https://doi.org/10.1016/j.jclepro.2021.126957>.
- [11] Epelde, L., L. Jauregi, J. Urra, L. Ibarretxe, J. Romo, I. Goikoetxea dan C. Garbisu. 2018. Characterization of composted organic amendments for agricultural use. *Frontiers in Sustainable Food Systems*, 2(44), doi: 10.3389/fsufs.2018.00044.
- [12] Casati L, F., Pagani, P.C. Braga, R.L. Scalzo, dan V. Sibilia. 2016. Nasunin, a new player in the field of osteoblast protection against oxidative stress. *J. Funct. Foods.*, 23: 474-484.
- [13] Bedada W., E. Karlton, M. Lemenih, dan M. Tolera. 2014. Long-term addition of compost and NP fertilizer increases crop yield and improves soil quality in experiments on smallholder farms. *Agric Ecosyst Environ* 195:193–201

- [14] Sulardi, T. Hakim, M. Wasito dan N. Lubis. 2022. Agribisnis Budidaya Tanaman Terong Ungu. PT Dewangga Energi Internasional. Bekasi. Yogyakarta
- [15] Lumbantobing, R., B. Hidayat, dan A. Lubis. 2020. The effect of cow manure and cow dung biochar application on p available and growth of corn plants in Ultisol. jurnal pertanian tropik. 7(3): 335- 344
- [16] Azis, A. H., M. Rizal, dan I. Rivai. 2023. The effect of animal manure compost on the production of eggplant (*Solanum melongena* L.). Jurnal Agrisistem, 19(1), 9-16.
- [17] Van den Ban dan H.S. Hawkins. 1999. Penyuluhan Pertanian. Penerbit Kanisius
- [18] Faisal, H.N., 2020. The Role of Agricultural Extension in Enhancing the Function of Farmer Groups (Case Study in Kauman District, Tulungagung Regency)