SPEKTA
(Jurnal Pengabdian Kepada Masyarakat: Teknologi dan Aplikasi)
ISSN 2723-8016 (online) | 2723-8008 (print)
Vol 4, No. 1, pp. 83-96

Empowerment of The Farmer Group Bisimo Etaikena in Managing Pig Livestock Waste to Become Organic Fertilizer

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ARTICLE INFO

Article history
Received : March 12, 2023
Revised : March 31, 2023
Accepted : April 5, 2023

Keywords:
Bisimo;
Composting;
Fertilizer
Pig
Waste

ABSTRACT

Background: The conversion of livestock manure into organic fertilizer is quite safe and not difficult to do. Compost is believed to improve soil texture by making the soil more friable. In order to increase food security and raise awareness of the value of health and the beauty of the environment for farmer groups that raise pigs, this activity aims to increase the knowledge and skills of farmers in Husoak Village.
Contribution: Provide knowledge and enhance abilities for turning pig manure into compost that is good for cultivated plants, in increasing food security and farmers' knowledge about the importance of health and sustainability.
Method: Conversation, Observation, and Socialization, providing assistance, engaging in manufacturing, and documenting
Results: As evidenced by the number of farmers applying it—5 in total with 1 farmer serving as a pioneer in adopting the use of pig waste compost, which reduces odor pollution—the use of pig manure as compost is succeeding.
Conclusion: that the compost processing training was completed within a month as planned, with the use of pig waste compost being observed in 5 farmers who had implemented the processing of pig manure into compost and had consumed the harvested products themselves. The next suggestion is to expand the use of composted pig manure as an agricultural input to ensure the sustainability of community agriculture.

INTRODUCTION

One of the business opportunities that has been active for a while in Indonesia with different business scales is pig farming. North Tapanuli, Nias, Toraja, East Nusa Tenggara, Bali, West Kalimantan, and Papua are just a few of the regions in Indonesia that have a reputation for housing pig farms. In Indonesia, raising pigs is regarded as a generational family business that is run on a part-time basis. In an effort to increase productivity, the species that are typically grown are local species that are released into the environment or kept in a semi-enclosure [1].

Because of the long-standing cultural order in the locals' social interactions, pig farming is a common activity in Wamena. In the adat culture that is present in Wamena and its surroundings, pigs have traditionally been used as dowry and a form of payment for ransom. In addition to farming, the people of the Central Mountains Region also raise pigs for food. In Wamena, each household typically keeps 2 to 10 animals. It is well known that there are subsistence or traditional pig farms in Papua [2]. This demonstrates that the pig farming system, as managed by farmers, is not properly implemented, particularly in managing their excrement, which can result in issues for the environment and humans. This is due to the fact that a traditional livestock system still involves pigs living next to people (the location of the stables is not far away, the remaining household waste is disposed of directly without experiencing collection or good processing techniques and processing of livestock manure which is only watered without well processed). When livestock manure is properly managed, it will also increase the potential for profit while reducing environmental pollution and global warming brought on by evaporation from pig manure [3]. In order to add value to the livestock industry, it is possible to use pig manure by converting it into the organic fertilizer that plants require [4].

Pigs are raised by almost all local farming households in Wamena, and naturally, this results in the production of livestock manure, either liquid or solid, which is only ever thrown away or washed. This waste, which comes in the form of leftover food and urine, can pollute the environment if it is not properly managed. The term "livestock waste" is ultimately used to describe the animal manure [5]. Everything that livestock release that emits odors, whether in solid or liquid form, and has not been properly managed is considered to be livestock waste. In accordance with the autonomy policy, the local government must put pig manure management into practice in order to create sustainability and comfort for the environment and the communities that inhabit it. Pig farms are a manifestation of this development.

The controversy brought on by the existence of an improperly run pig farm has contaminated the surrounding area with the smell it produces and also contaminated the river water. Residents of the neighborhood will undoubtedly become agitated and uneasy as a result of this. This polemic is also faced by the Bisimo Etaikena farmer group who are also pig breeders in Husoak Village, Hubikiak District, Jayawijaya Regency. This is based on data on waste generated as much as 326.14 tons per day (119,042.34 tons/year) in Papua Regency (SIPSN, 2022) [6]. The answer is to cultivate a well-run pig farm, which involves doing things like putting up cattle pens and turning livestock manure into compost, to create beautiful and healthy environmental conditions. By participating in this volunteer activity, farmers who raise pigs can learn more about composting pig manure and its benefits. This process is then followed by the practice of mentoring pig farmers as they turn their livestock waste into usable compost.

The main drivers behind this community service project are a lack of concern for farmers and a lack of knowledge among farmers regarding the use of livestock manure as fertilizer. because of the effects on the environment, such as air pollution brought on by the aroma produced. Poorly processed livestock manure can lead to unpleasant smells, air pollution, and

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the spread of disease [7]. Additionally, the process of raising pigs can contaminate the air with odors brought on by the NH_3 content, which is known to be produced from livestock manure and has a negative impact on human health. Up to 40 ppm of NH_3 in the air can cause headaches, nausea, and loss of appetite in people, and if these issues are not resolved, they could be fatal to the health of the locals [8].

Because of the nutrient content needed by soil and plants, processing of livestock manure is well known. As a result, if it is properly cultivated, soil and plant productivity can both increase. It is well known that fertilizers made from livestock manure have high nutrient contents (phosphorus and potassium). According to [9] is analysis of the nutritional content of pig manure bokashi, 3.23% of pigs, 1.634% of goats, and 1.905% of cattle ingested it. Furthermore, this is supported by the findings of a study by [10], which found that using livestock manure as organic matter can increase soil fertility, particularly the biological properties of the soil. Then, [11] argued that because it can be processed on-site at a farm, using organic fertilizer made from livestock manure can boost tomato yields while lowering fertilizer purchase costs. The findings of [12] is study, which suggested that vegetable crop yields would rise with the use of organic fertilizers and pesticides, support this. Many farmers are beginning to switch from using non-organic materials, which have healthier benefits and fertilize plants with better production, to organic ones [13].

Livestock manure can be processed into organic fertilizer in a relatively safe and simple manner, either alone or in combination with other readily available ingredients [14]. The supporting materials and quality also differ, for example, agricultural waste with different organic matter properties [15]. Additionally, there is a lot of nitrogen in pig manure, which is a key component in composting. Additionally, pig manure contains two times more potassium (K) than cow and goat manure [16]. It is well known that nitrogen and potassium are the two macronutrients that plants need the most for photosynthesis and to promote growth.

It is well known that if an activator is not used during the composting process to break down organic matter, the decomposition process will proceed unevenly over a prolonged period of time. The in question activator material is a kind of local microorganism (MoL) derived from organic waste, such as household waste or market waste made from the rotting of fruits and vegetables. MoL is used because it contains complex nutrients (macro and micro), microbes that actively contribute to the decomposition of organic matter, growth-stimulating compounds, and pest and disease control agents that contribute to the acceleration of composting [17]. Natural fertilizers are essential because they support the soil's physics, chemistry, and biology, which serve to maximize fertilization effectiveness and land resources [18].

An efficient technical culture measure for promoting plant growth is the proper and consistent use of organic fertilizers. The importance of organic fertilizers for the soil is in the process of loosening the top soil's surface horizon, increasing the presence of groups of soil organisms, increasing the soil's capacity to absorb nutrients, and storing water, all of which can improve soil fertility [19]. Natural fertilizers are essentially the detritus of living things, such as feces, feathers, carcasses, plant residues, or decaying household waste. Manure, which contains complex nutrients (macro: N, P, K, and micro: Ca, Mg, S, Na, Fe, and Mo), is the source of its existence in both liquid and solid form [20].

Manure for cows, horses, goats or sheep, pigs and poultry, depending on the type of livestock, is one category [21]. Plant growth and development are influenced by the type of

manure and its quality. Compared to cow and goat manure, chicken manure is known to have the advantage of absorbing nutrients (N, P, K, and Ca) [19].

Compost is created from the remains of decaying living organisms and can be made from livestock manure. Its presence not only contributes nutrients but also maintains soil and plant productivity. It also contributes to soil fertility optimization by restoring the physical qualities of soil that have been harmed by excessive inorganic fertilizer use, which has resulted in long-term damage to soil structure [22]; [23]. Compost can enhance soil texture by loosening it up and allowing for better airflow and drainage, which will in turn promote root growth and development [24].

According to discussions and first-hand field observations, the following are the polemics that farmer groups encounter:

1) Considering that the livestock pens are situated so close to the farmer's home, both the locals and the environment are negatively impacted,
2) Owned pig farms' livestock manure is not processed; instead, it is sent to be thrown out when cleaning the pens. It can also be poured into the provided drain hole, allowed to solidify, and then removed to be used as fertilizer. The use of this method as fertilizer takes a while, though.
3) Problems arise from ignorance of proper handling and processing techniques for livestock manure.

For this reason, it is necessary to have an activity that can provide further understanding in the form of skills in turning pig manure into compost so that it is beneficial for cultivated plants. Therefore, through collaboration activities to build the nation (KOSABANGSA) STIPER Petra Baliem Wamena accompanied by a companion team from Tanjungpura University, mentoring and counseling programs related to the processing of pig manure were carried out for the purpose of increasing the human resources of farmers in Husoak Village, Hubikiak District in utilizing livestock waste at September 2022 until Desember 2022. pigs into compost which can be effective in enhancing food security and awareness regarding the importance of health and also the beauty of the environment for farmer groups who raise pigs.

METHOD

The resources used during this activity consisted of: collected livestock dung, grass, tarpaulin, instructional booklets, and MoL prepared from stale rice waste and pineapple juice. Furthermore, the gear employed comprised of a camera, shovel, and stationery. The way of implementing this service activity consists of:

1. Observation

   Observations or direct surveys to the field are actions in documenting occurrences that were carried out during the activity, commencing from the initial survey of partner locations with or without tools. In this service activity, observation is the key benchmark utilized by the team while gathering data by observing and recording in a methodical and organized manner what is observed in the field.

2. Discussion and Outreach

   When the socialization took place and even after it had taken place, the farmer groups and the KOSABANGSA implementation team continued the question and answer stage by having discussions with resource people about the supplied material.

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3. Provider

Together with the practice of composting, the mentoring process is conducted. This activity was carried out in order to be able to directly assist farmers in producing compost, so that farmers can quickly comprehend and recognize the necessary tools and effective compost processing techniques. The procedures for creating compost from waste pig manure:

1) Preparation of additional materials (MoL, Straw)
2) Prepare pig livestock
3) Making mole involves combining stale rice, sugar, leri water (used to wash rice), and decomposed pineapple. These ingredients are then evenly mixed and allowed to ferment for two weeks.
4) Combine grass and leaf litter or manure and straw.
5) When the mixture is blended, the MoL solution is sprinkled evenly over it and slowly until it does so (this can be checked by tightly gripping the mixture to see if it drips; if it does, it will bloom when the grip is released or the water content reaches 30%).
6) creating a composting pit that is 2 x 2 meters in size and covered with a 6 x 8-meter tarp.
7) During the decomposition process, it is anticipated to carry out the reversal process every two days. All materials are placed into the excavation hole that has been made, mixed evenly, covered, and left for 14 days.
8) If the compost appears to be dry, add water by sprinkling it gradually while turning the pile.
9) Check the compost's maturity level by opening it after two weeks or 14 days have passed. Jet black in color, loose in texture, not hot, and odorless describe compost that is ripe and ready for use.

4. Documentation

Finding information about the observed issues in the form of notes, transcripts, books, newspapers, meeting minutes, agendas, and so forth is the goal of this session. Because it makes the process of further analysis easier, using this technique is required for this community service project.

5. Monitoring and Evaluation

At the end of each program an evaluation is carried out by giving questionnaires and interviews to find out the responses and understanding of each participant from the PKM implementation carried out by the Team, the evaluation is expressed in the following indicators can see in the table 1.

Table 1. Program Implementation Indicators

No.	Indicators	Before	After
1.	Partners understand the Organic Farming System.	50 %	85 %
2.	Partners understand the use and utilization of pig livestock waste as compost and its benefits in the Plant Cultivation Process.	50 %	90 %
3.	Number of partners implementing a fertilization system based on pig manure compost.	5 %	30%
4.	Independent partners make their own compost themselves.	5 %	30 %

5.	Partners are able to understand the various sources of organic fertilizers in the field of organic farming and understand the importance of nutrients for land and plant productivity.	50 %	95 %

The diagram of the stages of the method of implementing this activity can see in the figure 1.

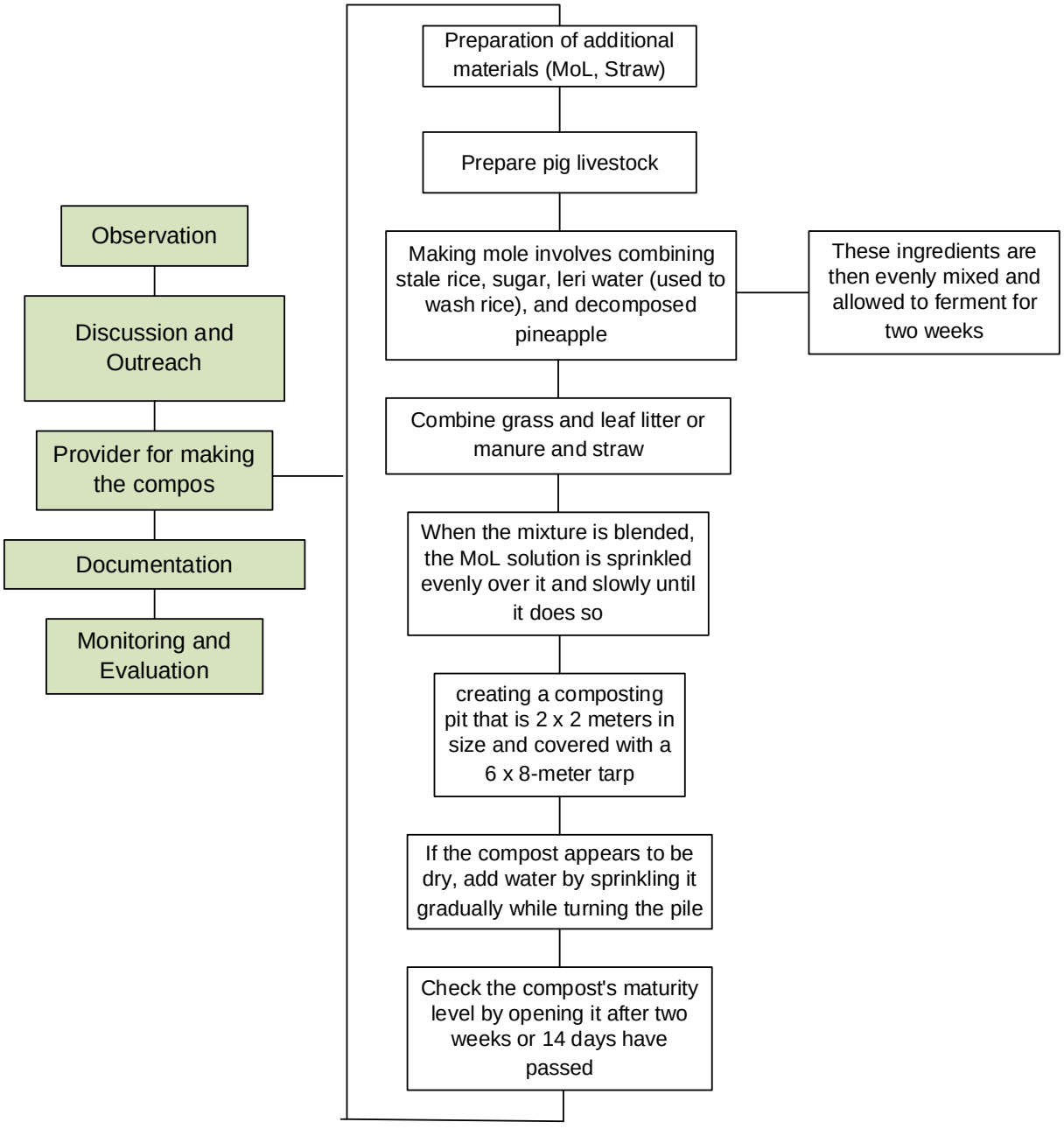

Figure 1. Implementation of community service activities for composting pig manure waste

RESULTS AND DISCUSSION

The KOSABANGSA implementation team used the earlier-described method, realizing each stage as follows in response to the issues they encountered on the job:

1. Obtain written permission from the local government (District and Village to farmer groups) in order to explain your intentions and the reason for your activities (figure 2).

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Figure 2. Overview and Licensing Procedure

2. The leader of the Bisimo Etaikena farmer group should be consulted regarding the form of implementation to be used, as well as the time and location of the socialization and the demonstration plot of the cage being used as the composting location (figure 3).

Figure 3. Pilot Pig Cattle Cages' Location

3. Figure 4 and figure 5 are socialize people about turning animal waste into compost and demonstrating how to make pig feed from kitchen scraps, waste water, pineapple water or skin, and stale rice as local microorganism producers (MoL).

Figure 4. Socialization Process Takes Place.

Figure 5. A MoL example with an explanation.

In the Husoak village's St. Markus Welitulik, under the guidance of resource person Mrs. Inrianti, S.P., M.Sc., socialization activities and composting practices were implemented (Lecturer of Fertilizers and Fertilization, Agrotechnology Study Program, STIPER Petra Baliem Wamena). 25 farmers and breeders participated in this activity. The benefits of using pig livestock waste as a source of organic fertilizer to improve soil fertility were discussed during socialization. If the waste is fermented first, it becomes high-quality organic fertilizer, which can improve soil fertility.

The technology that was demonstrated during the training involved fermenting pig livestock waste with an activator made of MoL. (Local Microorganisms of stale rice and pineapple waste). The fermentation process for livestock manure is used to get rid of odors that are unpleasant because of the ammonia present, and it also has the potential to hasten the conversion of livestock manure into fertilizer. Additionally, after the socialization stage, move on to the demonstration stage of composting pig manure. In a similar vein, the resource person described how breeders can create MoL (Local Microorganisms) from household waste (such as stale rice, vegetables, and pineapple fruit waste) to act as a decomposer.

4. Assisting with composting pig livestock waste and providing practice can see in figure 6.

Figure 6. Excavation Stages for Pig Manure Embedding.

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Figure 7. Shows how to embed pig manure in holes when digging.

Figures 6 and 7show the procedures for creating compost from waste pig manure:

1) Preparation of additional materials (MoL, Straw)
2) Prepare pig livestock waste
3) Making mole involves combining stale rice, sugar, leri water (used to wash rice), and decomposed pineapple. These ingredients are then evenly mixed and allowed to ferment for two weeks.
4) Combine grass and leaf litter or manure and straw.
5) When the mixture is blended, the MoL solution is sprinkled evenly over it and slowly until it does so (this can be checked by tightly gripping the mixture to see if it drips; if it does, it will bloom when the grip is released or the water content reaches 30%).
6) creating a composting pit that is 2 x 2 meters in size and covered with a 6 x 8-meter tarp.
7) During the decomposition process, it is anticipated to carry out the reversal process every two days. All materials are placed into the excavation hole that has been made, mixed evenly, covered, and left for 14 days.
8) If the compost appears to be dry, add water by sprinkling it gradually while turning the pile.
9) Check the compost's maturity level by opening it after two weeks or 14 days have passed. Jet black in color, loose in texture, not hot, and odorless describe compost that is ripe and ready for use.

When this practical activity was conducted, the breeders took it very seriously as evidenced by their submission of answers to the questions posed, such as: 1) how to use MoL, 2) How many doses of MoL are needed, 3) How long does MoL ferment, 4) What kind of manure is taken (solid or liquid), 5) What kind of fertilizer is used for any type of plant, 6) and others. The issues brought up improved the sense of unity among the volunteers. The KOSABANGSA team gave 25 L MoL to the attendees as a gift to thank them for coming to the socialization and to encourage farmers.

During the composting exercise, the KOSABANGSA team also taught the composting procedure for pig dung in the form of booklets so that group members could readily comprehend and save them for later use. Moreover, it conveys the significance of organic fertilizer for raised plants. One of the farmers who is also a pig breeder has recently gained notoriety for producing organic fertilizer from pig manure. This achievement was obtained from the implementation of this community service activity and is considered a result of the

implementation of the activity. owing to the utilization of pig manure as organic fertilizer that has been implemented. Additionally, the process of analyzing the nutrient content is still in progress because samples must be sent outside of Wamena, where they will undoubtedly experience a lengthy journey process and lines at the destination laboratory. It is hoped that soil analysis findings that have undergone compost treatment can serve as a guide when planting. It is known that certain decomposers from the classes Azotobacter sp., Lactobacillus sp., yeast, photosynthetic bacteria, and cellulose decomposing fungi are present during the fermentation process of compost. Pig manure compost can be made more quickly than conventional compost thanks to the ongoing fermentation process [25].

The benefit of compost over chemical or inorganic fertilizers is that compost contains microorganisms that are highly effective at acting as decomposers, destroyers, and decomposers. This aids in the process of decomposing soil organic matter quickly, which increases the presence of vital elements in the soil like nitrogen, phosphorus, and potassium, so that it is easily absorbed by plant roots [26]. Complex nutrients are present in compost as is (macro: N, P, K, Mg, S, Ca and micro: Zn, B, Fe, Cu, Mn, Mo and Cl). It also has crucial microbial species that help control soil pathogens [27].

When considering the enthusiasm and participation of the community as well as the involvement of village officials in the activities carried out, partners find that compost processing offers a novel experience, and they are willing to turn the program into a work program for the Bisimo Etaikena farmer group. With the implementation of the pig manure processing program, farmers are more inclined to produce their own organic fertilizer for personal use or as a potential new source of revenue for farming families. Due to a shift in the middle and upper classes' perspectives on the value of having access to organic food and the growth of the ornamental plant industry in Wamena and its surroundings, there are opportunities for compost processing to be used as a source of income. The team's successful achievements in the field are as follows:

Table 2. Achievement indicators of success.

No.	Indicators	Before	After	
			%	Quantity
1.	Partners understand the Organic Farming System.	50 %	75 %	19
2.	Partners understand the use and utilization of pig livestock waste as compost and its benefits in the Plant Cultivation Process.	50 %	85 %	21
3.	Number of partners implementing a fertilization system based on pig manure compost.	5 %	30%	7
4.	Independent partners make their own compost themselves.	5 %	30 %	7
5.	Partners are able to understand the various sources of organic fertilizers in the field of organic farming and understand the importance of nutrients for land and plant productivity.	50 %	85 %	21

When this activity is successfully implemented, it can reach the goals that were established at the outset, namely: as evidenced by the number of farmers applying it—5 in total, with 5 farmer serving as a pioneer in adopting the use of pig waste compost, which reduces odor pollution—the use of pig manure as compost is succeeding.

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CONCLUSION

The activity's implementation led to the following conclusion: Compost processing is simple to carry out even though it takes some time because farmers' responsiveness is generally low, necessitating repeated material deliveries. Also, turning the compost over takes time if you want good results from composting. Also, socialization activities and the composting of livestock manure were carried out in accordance with the specified plan. This is corroborated by the number of implementation indicators in the field, where the percentage of partners who comprehend the organic farming system before implementation is 50% and reaches 75% after the activities are implemented (19 farmers do), as well as the percentage of partners who comprehend the use and utilization of pig livestock waste as compost and its advantages in the plant cultivation process With the implementation of this service, the percentage of farmers who made and used pig animal waste compost on their agricultural land increased from 5% to 30% (7 farmers), from 50% to 85% (21 farmers). The number of Partners who can now grasp the various sources of organic fertilizers in the field of organic farming and the significance of nutrients for the productivity of the land and plants is 85% (21 farmers), up from only 50% previously. The team then approved the outcomes so they could continue the mentoring process in order to fully integrate it into partners' agricultural land and to prepare it for commercialization.

Acknowledgement

We would like to express our gratitude to the Directorate of Research, Technology, and Community Service, Directorate General of Higher Education for their financial support through the KOSABANGSA program, LP2M Tanjungpura University for the partners they provided to help until the completion of this service activity, and LP2M STIPER Petra Baliem for their involvement during the implementation of the activity. The Bisimo Etaikena Farmers Group, the extended family of St. Markus Welitulik Chapel, and resource people who had the chance to attend the socialization in the field, which took place in Husoak Village, Hubikiak District, participated in this dedication.

REFERENCES

[1] Dewi, G. A. M. K. Materi Ilmu Ternak Babi. Bahan Ajar. pp. 62. 2017
[2] Tulak A, Khaerunnisa and Landius. Strategi Pengembangan Peternakan Babi Di Distrik Hubikiak Kabupaten Jayawijaya. Jurnal OPTIMA, vol. 36, no. 3, pp. 190-198. 2011.
[3] Wea R., A. Y. Ninu., dan B. B. Koten. Peternakan Babi Berbasis Zero Waste. Jurnal Pengabdian Kepada Masyarakat, vol. 23, no. 3, pp. 320-327. 2017.
[4] Sumadewi N. L. U., dan D. H. D. Puspaningrum. Pemanfaatan Limbah Kotoran Ternak Babi untuk Pupuk Di Banjar Pengiasan Desa Mengwi Kabupaten Badung Bali. Jurnal Paradharma, vol. 3, no. 1, pp. 39-42. 2019.
[5] Foenay T. A., & T. N. I. Koni. Pengolahan Limbah Ternak di Kelompok Peternak Maulafa. Jurnal Pengabdian Masyarakat Peternakan, vol. 2, no. 1, pp. 37-43. 2017.
[6] SIPSN. Kementerian Lingkungan Hidup dan Kehutanan Direktorat Jenderal Pengelolaan Sampah, Limbah dan B3 Direktorat Penanganan Sampah. 2022 SIPSN - Sistem Informasi Pengelolaan Sampah Nasional (menlhk.go.id) [Access in 31 March 2023]
[7] Asmara, A., Hutagaol, M. P., & S. Salundik. Analisis Potensi Produksi dan Persepsi Masyarakat dalam Pengembangan Biogas pada Sentra Usaha Ternak Sapi Perah di

Kabupaten Bogor. Jurnal Agribisnis Indonesia, vol. 1, no. 1, pp. 71–80. 2013. DOI: https://doi.org/10.29244/jai.2013.1.1.71-80

[8] Nurhapsa, Suherman, & Irmayani. Optimalisasi Limbah Ternak sebagai Pupuk Organik di Batu Mila Kecamatan Maiwa Kabupaten Enrekang, Sulawesi Selatan. Jurnal Pengabdian kepada Masyarakat, vol. 6, no. 2, pp. 88-93. 2020.

[9] Kusuma, M. E. Pengaruh Beberapa Jenis upuk Kandang Terhadap Kualitas Bokashi. Jurnal Ilmu Hewani Tropika, vol. 1, no. 2, pp. 41-46. 2012.

[10] Dinesh, R., V. Srinivasan, S. Hamza, & A. Manjusha. Short-term incorporation of organik manures andbiofertilizers influences biochemical and microbial characteristics of soils under an annual crop turmeric (*Curcuma longa* L.). Bioresource Technol. No. 101, pp. 4697- 4702. 2010.

[11] Pangaribuan D. H., Yasir M. Utami N. K. Dampak bokashi kotoran ternak dalam pengurangan pemakaian pupuk anorganik pada budidaya tanaman tomat. J. Agron. Indonesia, vol. 40, no. 3, pp. 204 – 210. 2012.

[12] Annisava A. R. Optimalisasi pertumbuhan dan kandungan vitamin c kailan (*Brassica alboglabra* L.) menggunakan bokashi serta ekstrak tanaman terfermentasI. Jurnal Agroteknologi, vol. 3, no. 2, pp. 1-10. 2013.

[13] Siswati L., R. Nizar, dan A. Ariyanto. Manfaatkan Kotoran Sapi Menjadi Kompos Untuk Tanaman Masa Pandemi Di Kelurahan Umbansari Kota Pekanbaru. DINAMISIA: Jurnal Pengabdian Kepada Masyarakat, vol. 5, no. 2, pp. 531-537. 2021. DOI: https://doi.org/10.31849/dinamisia.v5i2.6343,

[14] Yuliani F. dan F. Nugraheni. Pembuatan Pupuk Organik Kompos Dari Arang Ampas Tebu dan Limbah Ternak. Jurnal Sains dan Teknologi. Vol. 1, No.:1: 1-11. 2010.

[15] Hartatik, W. & D. Setyorini. Pemanfaatan Pupuk Organik untuk Meningkatkan Kesuburan Tanah dan Kualitas Tanaman. Badan Penelitian Litbang Pertanian Balai Penelitian Tanah. Bogor. Prosiding Seminar Nasional Teknologi Pemupukan dan Pemulihan Lahan Terdegradasi, pp. 571–582. 2012.

[16] Sihombing, D.T.H. Ilmu Ternak Babi, Cetakan kedua, Gadjah Mada University Press, Yogyakarta. 2006

[17] Purwasasmita M. dan Kunia K. Mikroorganisme Lokal Sebagai Pemicu Siklus Kehidupan dalam Bioreaktor Tanaman. Seminar Nasional Teknik Kimia Indonesia SNTKI 2009. Bandung 19-20 Oktober 2009.

[18] Widyasari N. L., I. W. B. Suyasa, dan I. G. B. S. Dharma. Upaya Pengolahan Limbah Kotoran Babi Menjadi Kompos Menggunakan Komposter Rumah Tangga. J. Ecotrophic. Vol. 12, No. 2, pp. 104-116. 2018.

[19] Widowati. Pengaruh Kompos Pupuk Organik Yang Dipekaya Dengan Bahan Mineral dan Pupuk Hayati Terhadap Sifat-Sifat Tanah, Serapan Hara dan Produksi Sayuran Organik. Laporan Proyek PenelitianProgram Pengembangan Agribisnis. Balai Penelitian Tanah. 2004.

[20] Purwendro. S., dan Nurhidayat. Mengolah sampah untuk pupuk dan pestisida organik Seri Agritekno Penebar Swadaya, Jakarta. 2006.

[21] Kafrawi A. & Z. Kumalawati. Utilization of Compost Variety of Livestock Manure and its Application on Media Plant of Cocoa Seedling. Jurnal ilmiah udidaya dan pengelolaan tanaman perkebunan AgroPlantae, vol. 7, no. 2, pp. 20-27. 2018.

[22] Yuwono, D. Kompos. Penebar swadaya. Jakarta. 2005.

[23] Hartono E., N. Iriyanti, & R. S. S. Santosa. Penggunaan Pakan Fungsional Terhadap Daya ikat Air, Susut Masak dan Keempukan daging Ayam Broiler. Jurnal Peternakan, vol. 1, no. 1, pp. 10-19. 2013.

[24] Noverita, S. V. Pengaruh pemberian nitrogen dan kompos terhadap komponen pertumbuhan tanaman lidah buaya (*Aloe vera*). Jurnal Penelitian Bidang Pertanian, vol. 3, no. 3, pp. 57-67. 2005.

[25] Nurbani. Beternak Babi. 2020. http://kaltim.litbang.pertanian.go.id/ind/index.php [Diakses, 20 Desember 2022].

10.12198/spekta.v4i1.7832

[26] Wang S, Liang X, Luo Q, Fan F, Chen Y. and Z. Li. Fertilization increases paddy soil organik carbon density. Journal of Zhejiang University, vol. 13, no. 4, pp. 74-82. 2012.
[27] Malelak G. E. M., T. Dadu, Tenang & I. G. N. Jelantik. Pemanfaatan Feses Babi Untuk Pembuatan Pupuk Bokashi. Jurnal Pemberdayaan Masyarakat Petani, vol. 3, no. 1, pp. 310-315. 2022.

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10.12198/spekta.v4i1.7832