



Training and Educating of Pineapple Farmers in Producing Organic Fertilizer Using The Bio-EM4 Application Technology in Lendang Nangka Utara Village, Masbagik, East Lombok

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Abstract: The aim of this community service activity is to train and mentor farmers to produce organic fertilizer from cattle pen waste to create a village community that is self-sufficient in meeting the fertilizer needs for its pineapple farming business. The activity used a participatory action method, which was carried out for 19 months. The results of the activities show that the implementation of the activities ran smoothly and successfully. Farmers' participation and enthusiasm, which was previously moderate, turned out to be increased to high after implementing direct assistance in the field. Farmers' knowledge and skills are increasing as evidenced by the fertilizer produced based on SNI standards which is classified as good quality. Organic fertilizer produced by farmers can be used as a substitute for Urea, ZK and TSP fertilizer because application of a dose of 25 tons ha⁻¹ plus NPK *Ponska* dose of 100 kg ha⁻¹ can balance the growth and yield of pineapple in plots fertilized with NPK dose of 500 kg ha⁻¹. So the recommended application dose for organic fertilizer produced by this program is 25 tons ha⁻¹ plus NPK *Ponska* 100 kg ha⁻¹ with the application time after soil processing.

Keywords: Enthusiasm; Animal waste; Participation; Organic fertilizer; Pineapple plants

Introduction

Improving community welfare spurs an increase in food needs that are increasingly diverse and of high quality with stable product continuity (FAO, IFAD and WFP, 2013; Menko **Bidang Perekonomian, 2021**). In addition, with the increasing public awareness of the nutritional value of food, the need for fresh fruits is certainly increasing (Kaparapu, et al., 2020). However, the production of certain fruits cannot be pursued carelessly according to our desires, because there are certain limits for a type of fruit plant to be cultivated in each region or the suitability of the land to be able to grow and produce optimally. Some important factors that make it suitable for a type of fruit crop to be cultivated in a certain area are, the altitude of the place,

the average daily temperature, rainfall and soil chemical reaction (pH) which at certain limits can be tolerated and managed (Hossain, 2016; Ngawit et al., 2021).

One type of fruit that is widely cultivated by farmers and is quite popular in Lombok is pineapple. Lendang Nangka Utara Village is the largest pineapple producing area in the Lombok region. This village is one of 10 villages located in Masbagik, Lombok Timur, Nusa Tenggara Barat Province (NTB), Indonesia. Lendang Nangka Utara Village consists of 12 kampongs, namely Benteng Selatan, Benteng Utara, Benteng Montong Sube, Gawang Malang, Lowak Swak, Kapitan, Otak Pancor, Otak Pancor Utara, Borok Lelet, Gonjong Utara, Jimse, and Masjid Bagik. This village has a population of approximately 55000 people, most of whom are ethnic in the Sasak area. The majority of people in Lendang

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Nangka Utara village are professional pineapple farmers, cattle farmers and traders. In addition, a small part of the community works in government agencies and other institutions. (BPS NTB, 2018; Ngawit et al., 2023a).

The average income of farmers every year by cultivating pineapple plants on an area of 0.20 – 0.25 ha can reach 10-20 million rupiah. This income is obtained from the sale of freshly harvested pineapples. Generally, the larger the land planted, the more pineapple harvest will be obtained. In addition to the land area, the condition of the planted soil also affects the pineapple harvest. If the soil fertility condition is good, then the pineapple fruit to be harvested will be better in quantity and quality (Hazra et al., 2019). The high income of farmers causes the intensity of planting to increase, thus having an impact on decreasing soil fertility (Afandi et al., 2015). Ngawit et al. (2023a) stated that if farmers do not fertilize with Urea, ZK and TSP fertilizers, the yield of pineapple plants obtained is very low and even in some places it can fail to harvest.

In addition to the problem of soil fertility conditions, topography also affects pineapple harvest in the North Lendang Nangka village area. The topographic condition of the soil in the village is uneven with undulating and hilly curves. As a result, soil fertility also varies so that the pineapple harvest is uneven in each hamlet. The effort made by pineapple farmers to overcome the infertile soil condition is to apply N, P and K inorganic fertilizers in high doses so that the harvested pineapple fruits are large and of good quality. The average fertilizer requirement for pineapple plants is 1000 kg of Urea or ZA ha⁻¹, 750 kg P ha⁻¹ and 750 kg K ha⁻¹ (Ngawit et al., 2023a). The pineapple planting period for one harvest is 18 months. Fertilization is carried out twice, the first fertilization is carried out when the plant is 6 months old, then the second fertilization is carried out after the plant is 10-12 months old (Hazra et al., 2019).

One of the obstacles that is a big issue in the pineapple cultivation business today is the existence of scarce and expensive in-organic fertilizers (Upland.psp.pertanian, 2023). Most pineapple farmers in the region complain about the very limited availability of fertilizer. Farmers find it difficult to get fertilizer to meet the fertilization needs of the pineapple plants they are planting. Pineapple plants that lack fertilizer will produce small pineapple fruits with thin pulp. Small pineapples are less popular with consumers and have low selling power. The high price of fertilizer is also an obstacle for pineapple farmers, especially non-subsidized fertilizers. The price of non-subsidized fertilizers can be twice the price of subsidized fertilizers. The distribution of subsidized fertilizer in Lendang Nangka Utara Village is uneven for each kampong, there

are several kampongs that get subsidized fertilizer and vice versa there are kampongs such as in Otak Pancor Utara while pineapple farmers in this kampongt do not get the subsidized fertilizer (Ngawit et al., 2023a). Anticipating the negative impact of this phenomenon is to find alternative sources of fertilizer materials. One of them is by utilizing kohe (animal manure) and cow pen waste as well as agricultural waste and other forage into organic fertilizers to replace the use of inorganic fertilizers which are increasingly expensive and scarce (Ngawit et al., 2022a). This step is in accordance with the government's program in an effort to reduce the distribution of subsidized fertilizers, one of the focuses of which is the use of organic fertilizers from kohe raw materials, livestock pen waste, and renewable plants (Minister of Agriculture of the Republic of Indonesia, 2017; Ngawit et al., 2022b; Ngawit, 2022).

Based on the conditions of blame faced by pineapple farmers in the Kampong of Otak Pancor Utara, it is very important to improve the knowledge and skills of farmers to manage pineapple plants efficiently. Appropriate technology, cheap and easy to do, especially in processing cow manure and waste into quality organic fertilizer with economic value, is very important to increase income and additional sources of income for farmers. Bio-EM4 technology is a technology based on airtight fermentation utilizing lignocellulotic probiotic bacteria such as *Lactobacillus sp.*, *Rhodopseudomonas sp.*, *Actinomycetes sp.*, *Streptomyces sp.*, *Bacillus sp.* and cellulose-degrading fungi such as *Trichoderma viride*, *Aspergillus niger* and *Helminthosporium sp.* (Subowo, 2015). Bio-EM4 has been proven to be a decomposer starter that is able to turn kohe, livestock pen waste, agricultural waste and other forage into quality organic fertilizer. This appropriate technology that is applicable, practical, easy and cheap has great potential to be developed to realize an independent hamlet community in meeting the needs of fertilizer for their pineapple farming. Therefore, pineapple farmers in Otak Pancor Utara kampong were chosen as the object of assistance with several considerations between: 1) The number of pineapple farmers and the highest area of cultivated land compared to other kampongs; 2) Having resources in the form of cattle with a sufficient amount to produce waste raw materials for organic fertilizers and adequate land for pineapple farming; 3) The knowledge and skills of farmers in managing their farming are still lacking so that the results obtained have not been able to improve their standard of living.

The objectives of this community service activity include: 1). To ncrease the knowledge and skills of farmers to utilize cow pen waste and cow pen waste to produce organic fertilizer as an alternative fertilizer to replace the use of inorganic fertilizers; 2). To increase

sources of income for hamlet residents by increasing the productivity and efficiency of pineapple farming; 3). To improve the quality of the soil from being polluted by cow dung so that a clean, healthy and comfortable hamlet environment is created and free from pollution from the smell of cow dung. This service program also provides benefits for the academic community, among others, as a form of implementing the Tridarma of Higher Education to the community.

Method

The implementation of this community service uses the Participatory Action Program method, which is a program implementation team that involves farmers in every activity from the beginning of the implementation to the evaluation of the activity. The activity was carried out in Pancor Otak Utara kampong, Lendang Nangka Utara Village, Masbagik, East Lombok Regency, West Nusa Tenggara. The implementation of activities started from January 2022 to August 2023.

The materials used in this activity include: Cow manure, barn waste, feed residues and forage that have been mashed, EM-4 yellow repack agriculture for bio activator fermentation of leftover feed and fine forage, EM-4 blue repack for bio activator fermentation of kohe and livestock manure waste, molasses, fine bran, NaCl, Urea fertilizer, TSP fertilizer, ZK fertilizer, NPK Ponska, pineapple seeds. Meanwhile, the tools used include: hand tractors, hoes, rakes, machetes, scythes, calter knives, plastic ropes, buckets, 1000 ml erlenmeyer, plastic stirrers, strainers, 2 mess sieves, plastic tarpaulins, bars, cameras and writing stationery.

Mechanism of Approach Applied

The mechanism of this activity is carried out through several stages, including: the determination of target farmers as partners, counseling and direct assistance in demonstration plot activities in the field and monitoring and evaluation of program progress. The approach carried out is from the bottom and from the top (Bottom-up and top down approach) by paying close attention to the knowledge, skills and local wisdom (indigenous knowledge) of partner farmers (Syarifuddin et al., 2016).

Based on the problems faced by the target farmers, the program implementation team prepares steps to solve them based on the conditions in the field and the expected target goals as well as the participation of the community within the hamlet. According to Ngawit et al. (2021), the success of every implementation of the study program on the application of appropriate technology to the community is highly determined by the enthusiasm, participation and role of citizens. Therefore, counseling and training activities were

carried out for 30 farmers who were willing and enthusiastic to participate in all series of activities that had been determined. The counseling and training activities aim to provide knowledge and skills to farmers about the production, management and application of organic fertilizers for pineapple plant cultivation. At the extension event, the process of making organic fertilizer and its application in pineapple cultivation were introduced. The delivery of material on the process of making organic fertilizer is carried out by tutorial methods and direct practice in the field, starting from the collection of raw materials, sorting and cleaning of metals and plastics, the correct decomposition and fermentation process, harvesting, organoleptic tests, nutrient content tests in the laboratory and packaging.

The production of solid organic fertilizer is carried out with Bio-EM4 technology which begins with anaerobic fermentation (raw materials are sprayed with EM4 solution with a concentration of 10 ml liters of water-1 with a spray volume of 10 liters for 1 ton of raw materials) for a period of 4 weeks, then continued with smoothing and sieving. Furthermore, the organic fertilizer will be decomposed again for 1 - 2 weeks and after the process the organic fertilizer is tested organoleptically and in the laboratory and then immediately packaged. Pineapple cultivation techniques are explained and trained starting from the introduction and preparation of planting material (seedlings), soil tillage, arrangement of beds and planting plots, application of organic fertilizers, determination of planting time, planting techniques, maintenance, harvesting and post-harvest handling. Counseling and training materials were distributed in the form of leaflets and booklets.

Target audience farmers as well as cooperation partners in direct assistance activities in the field, are advanced farmers and at the same time as breeders with the widest area of pineapple farming land compared to other farmers. During the extension and training activities, the participation level of the enthusiasm and enthusiasm of the selected farmers is also higher and the most potential compared to other farmers. Based on these criteria, the target audience is used as a cooperation partner of 4 farmers. Each of these farmers has their farmland adjacent to each other in the same hamlet area. Intensive coordination was also carried out between the 4 partner farmers and other farmers which included things that needed to be prepared such as making the installation of the composting, decomposition and fermentation process of raw materials. The preparation of materials and tools is carried out by farmers with directions from the activity implementation team.

After the organic fertilizer is produced, then direct assistance is carried out in the field about the application

of the organic fertilizer on pineapple plants by way of application, especially the right time and dosage. The application time is carried out after soil tillage and the creation of planting beds, which are 1.5 – 2.0 m wide and length in proportion to the width of the planting area. Between the beds, a drainage channel was made with a width of 30 cm and a depth of 25 cm. The application dose of organic fertilizer is 20 – 25 tons of ha⁻¹ plus the application of NPK Ponska fertilizer as a basic fertilizer with a dose of 100 – 200 kg ha⁻¹ (Ngawit et al., 2023a). In each demonstration plot in each partner farmer, treatment plots are made as a comparison and evaluation. The treatment plots in question are: Application of NPK Ponska 500 kg ha⁻¹ with 0 tons of ha⁻¹ organic fertilizer and without application of NPK fertilizer (0 kg ha⁻¹) with 30 tons of ha⁻¹ organic fertilizer.

Data Collection and Evaluation Methods

Data collection was carried out purposively to the four partner farmers. In order to know the success of this activity in producing organic fertilizer and increasing pineapple crop yields, the data collection and evaluation carried out consists of three stages, namely:

1. Evaluation of the level of participation, enthusiasm, understanding and skills of target farmers at each stage of the activity was analyzed by quantitative descriptive method. The data used is the attendance and activity of the participating farmers in each activity. The activities of target farmers are measured based on the questions asked and their loyalty to all stages of the activity. Based on the observation data, the percentage of participation rate and enthusiasm of the target farmers is calculated, with the following formula (Suroso et al., 2014):
2. The level of understanding and skills of farmers about the extension and training materials provided is measured based on the percentage of questions that can be answered correctly, using the following formula (Amrullah et al., 2021):

$$P = \frac{XY}{X^2} \times 100 \% \quad (1)$$

where, P is the level of participation and enthusiasm of farmers, X is the number of farmers who attend and/or are active in each activity and Y is the number of farmers who are scheduled to participate in activities. The level of participation and enthusiasm of farmers was made into three categories, namely: low ≤ 33.33%; quite high >33.33% - ≤66.66 %;

$$I = \frac{pr}{r^2} \times 100 \% \quad (2)$$

where, I is the level of understanding and skills of farmers after receiving counseling, training and mentoring in the field, p the questions answered correctly and r the number of questions asked.

3. Plant growth data was measured based on the weight of fresh biomass of plants at the peak of their vegetative growth, which is in the age range of 8-10 months after planting. Observations were carried out on each treatment plot of 10 sample plants. Sample plants were determined by systematic random sampling. Crop yield data is measured based on the fresh weight of pineapple fruit yields, which is carried out at harvest time. Observations were made on tuber plots with an area of 1 m², as many as 10 tubers in each treatment plot. The distribution of tuber plots in each treatment is determined by the transak method with the distance between one plot and another tuber plot determined to increase the planting area. The growth and yield data of pineapple plants were analyzed using variant analysis based on the calculation of the average growth of sample plants and crop yields in tuber plots. Testing of variants between treatments uses the F test and if there is a real difference between treatments, a further test is carried out with an honest real difference test (BNJ) at a real level of 5%.
4. The economic analysis is simple with several parameters, namely business capital outside land acquisition, total production, gross income, net profit, IIP and BC-ratio.

The success of the implementation of this program is determined based on several indicators, namely: 1). A sustainable pineapple farming model has been formed; 2). The production and turnover of pineapple sales are increasing so that the income and profits obtained by farmers are increasing.

Result and Discussion

Results of Counseling and Training Activities

The implementation of counseling, training and direct assistance in the field has been smooth, orderly and fun. All stages of planned activities can be carried out according to the set schedule. The implementation of this activity consists of 3 service lecturers and is assisted by the community such as head of kampongs and community leaders and partner farmers in the kampong where the activity is carried out. Counseling and training materials were delivered by the activity implementation team with lecture and discussion methods as well as the delivery of learning materials directly with fidio and LCD monitor Power Point facilities. In addition, the activity implementation team also distributed booklets and leaflets of learning materials that had been delivered.

The farmers who were scheduled to participate in counseling and training activities were 30 people. The participation and enthusiasm of participating farmers

participated in counseling and learning activities in a tutorial manner in the medium category. However, at the beginning of the training and direct assistance activity in the field, the participation and enthusiasm of farmers is increasing. The level of participation of activity participants is measured based on attendance and participation in each activity, starting from the

counseling process, training and up to the mentoring process in the field. Meanwhile, the level of enthusiasm of participants was measured based on their enthusiasm, loyalty and activity in asking various questions and revealing problems encountered in their farming activities.

Table 1. The percentage of participation and enthusiasm of pineapple farmers in every extension, learning and mentoring activity in the kampong of Otak Pancor Utara, Lembang Nangka Utara village, Masbagik, East Lombok, NTB

| Types of Activities | Number of scheduled farmers | Number of farmers participating in each activity | Number of loyal and active farmers asking | Participant participation rate (%) | Participant enthusiasm level (%) | Participant participation categories | Participant enthusiasm category |
|---|-----------------------------|--|---|------------------------------------|----------------------------------|--------------------------------------|---------------------------------|
| Extension | 30.0 | 18.44 | 17.56 | 61.47 | 58.53 | Moderate | Moderate |
| Learning | 30.0 | 17.54 | 16.44 | 58.47 | 55.00 | Moderate | Moderate |
| Average | 30.0 | 17.99 | 17.00 | 59.97 | 56.67 | Moderate | Moderate |
| Training and Mentoring: | | | | | | | |
| Organic fertilizer manufacturing | 30.0 | 25.44 | 24.33 | 84.80 | 81.10 | High | High |
| Making Hay and silage preserved animal feed | 30.0 | 25.66 | 22.66 | 85.53 | 75.53 | High | High |
| Organic fertilizer application | 30.0 | 27.78 | 26.34 | 92.60 | 87.80 | High | High |
| Planting | 30.0 | 25.33 | 21.66 | 84.43 | 72.22 | High | High |
| Maintenance | 30.0 | 24.33 | 22.66 | 81.10 | 75.53 | High | High |
| Harvest | 30.0 | 22.44 | 20.44 | 74.80 | 68.13 | High | High |
| Post-harvest | 30.0 | 22.44 | 21.33 | 74.80 | 71.10 | High | High |
| Average | 30.0 | 24.77 | 22.77 | 82.57 | 75.90 | High | High |

The data in Table 1 shows that the average attendance of farmers who participate in counseling and learning activities through tutorial is 18 people, which is the smallest number, with a participation rate of 60.0% which is in the medium category with an enthusiasm level of 56.67% which is in the medium category. The average number of participating farmers increased sharply in the direct practice session of the organic fertilizer making process and its application in the demonstration plot assistance process in the field, which was 24.77 and the average number of active and loyal people was 22.77 people with a participation rate of 82.57% and an enthusiasm level of 75.90%, which was in the high category.

There are several things that are suspected to be the cause of the level of participation and enthusiasm of the participants of the activity which is only in the low category, namely the level of education, communication skills, age and profession of the participants (Suruso et al., 2014). This is in accordance with the opinion of Sudika et al. (2022), that community participation is related to the type of work, education, communication, leadership and age. Education greatly affects a person's knowledge and skills. The higher a person's education,

the wider the knowledge they have so that it is easier to accept new things related to appropriate technology. Age 40 - 50 years, more active and more participated compared to younger ages. Participating farmers who only work in agriculture are more participatory than those who have skills or jobs in other fields such as craftsmen, traders, and drivers (Ngawit et al., 2023a).

The level of participation and enthusiasm of farmers that was originally moderate can be increased after the implementation team and resource persons provide direct assistance in the field of the practice of making organic fertilizer, making preserved hay and silage animal feed and implementing demonstration plots (Figure 1). The participation, enthusiasm and motivation of farmers are increasing, after the resource person conveyed real examples through videos and photos about the success of coconut stand land management by planting several types of vegetable plants in Mumbul Sari village, Bayan district, North Lombok, NTB. As a result, the growth and yield of coconuts are improving so that the profits received by farmers increase, which is accompanied by an increase in farmers' income (Wangiyana et al., 2023). The success of the application of the allay cropping planting pattern

system on coconut stand soils is supported by fertilization that prioritizes the application of organic fertilizers produced by local farmers. Ngawit et al. (2022a), stated that the application of organic fertilizer at a dose of 25 tons ha⁻¹, in vegetable cultivation can reduce the use of NPK fertilizer by 50% - 75%, because the application of NPK fertilizer is quite applied once as a basic fertilizer.

The farmers looked more enthusiastic and more excited after the resource persons shared their experiences on how to make organic fertilizer using kohe raw materials, cage waste, plant waste and other forage and applied it to plants. The increase in the level of participation, enthusiasm and enthusiasm of farmers can occur due to the strong desire of farmers to improve their knowledge and skills in making organic fertilizers by utilizing manure and waste from cattle barns that are available in abundance around them. This result is in line with the report of Djoko et al. (2019), that the increasing participation and enthusiasm of farmers participating in extension, training and mentoring activities is due to the existence of real examples that can be seen and done directly by farmers.

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Figure 1. Extension activities (Upper left picture), kohe and cage waste as raw materials for organic fertilizer (Upper right picture) and Collection of organic fertilizer raw materials from Kohe and cow pen waste (Lower left picture) and training on the process of making organic fertilizer (Lower right picture).

The implementation of counseling, training and mentoring activities is able to increase the insight, knowledge and skills of farmers participating in organic fertilizer production activities and manage their pineapple crops more intensively through increasing the application of organic fertilizers produced by farmers themselves. The data in Table 2 shows that the material aspects and the presentation of extension, training and mentoring materials in the field, from the 8 questions asked, all were answered with the level of understanding of 96% of participating farmers, 3% lacking understanding and only 1% who did not understand at all. This means that the counseling, training and mentoring materials are understood and understood and needed by the participating farmers. Regarding the aspect of totors and resource persons, farmers' understanding reached 90% who did not understand 7% and those who did not understand at all only 3%. The understanding and skills of farmers in applying aspects of the implementation of demonstration plot activities in the field reached 91%, of which 7% did not understand and only 2% of participating farmers did not understand at all. So it can be stated that the activity implementation team and resource persons have succeeded in improving the

knowledge and skills of participating farmers about making organic fertilizer and applying it intensively to pineapple plants, so that the demonstration plot assistance activities in the field took place very smoothly and satisfactorily. It is not easy to change the attitudes, behaviors, habits and skills of farmers in adopting new technology in the field of plant cultivation. Because

according to Ngawit (2022), to change the behavior, habits and willingness of farmers to accept new innovations and appropriate technology in the field of crop cultivation, extraordinary actions are needed and not just ordinary actions and counseling.

Table 2. The results of mapping the level of understanding and skills of participating farmers towards counseling, training and direct assistance materials in the field about making organic fertilizers and their application in pineapple cultivation.

| No. | Question Aspect | Percentage of questions answered correctly (1), not answered or answered incorrectly (2) and not understood at all (3) | | |
|---|---|--|-----|-----|
| | | (1) | (2) | (3) |
| Aspects of Matri and Presentation of Matri | | | | |
| 1. | The learning materials provided are according to the needs of | 100% | 0% | 0% |
| 2. | The material presented is useful for farmers | 100% | 0% | 0% |
| 3. | The material provided is easy to understand and understand | 95% | 4% | 1% |
| 4. | The material presented was easy to apply by participating farmers | 95% | 5% | 0% |
| 5. | The presentation of the material is easy and can be followed and understood by participants | 85% | 10% | 5% |
| 6. | Syntitomatics of presenting sequential and logical material | 95% | 4% | 1% |
| 7. | The speed of presentation of the material whether the participants can participate | 95% | 4% | 1% |
| 8. | Examples, pictures, and videos as additional materials in line with the topic of the activity | 100% | 0% | 0% |
| Average | | 96% | 3% | 1% |
| Aspects of Resource Persons | | | | |
| 9. | The resource person mastered the material presented | 90% | 8% | 2% |
| 10. | Interesting and communicative speakers delivered material | 90% | 6% | 4% |
| 11. | The interviewee's answers are easy to understand and satisfying | 90% | 7% | 3% |
| Average | | 90% | 7% | 3% |
| Aspects of Activity Implementation | | | | |
| 12. | Implementation of each activity according to the set schedule | 95% | 4% | 1% |
| 13. | The service of the assistance implementation team in the field is satisfactory | 90% | 7% | 3% |
| 14. | Farmers always follow the instructions of the end-feeding team in the field | 90% | 9% | 1% |
| 15. | Planning and production process in the field is satisfactory | 90% | 8% | 2% |
| 16. | The results of pineapple fruit commodities that are cultivated according to the plan | 90% | 10% | 0% |
| 17. | The selling price of the resulting product is profitable | 85% | 12% | 3% |
| 18. | Harmony of mutual relationship between farmers and the implementation team | 95% | 2% | 3% |
| Average | | 91% | 7% | 2% |

Source: Data was processed from questionnaires and questions asked by the implementation team to farmers participating in the activity.

Results of Direct Assistance in the Field

The quality of the organic fertilizer products produced was evaluated at the Soil and Fertilizer laboratory of the Faculty of Agriculture, University of Mataram for analysis of the nutrient content. Based on the testing in the labotarius, the results were obtained as presented in Table 3.

The data in Tabe 3 shows that the solid organic fertilizer products produced by the target farmers have good

quality. This shows that the implementation of appropriate technology dissemination activities to target farmers is effective and successful, which is characterized by fairly high quality organic fertilizer products, both based on nutrient content analysis in the laboratory and organic observations. The results of organoleptic solidification showed that the texture and structure of the crumb fertilizer, not solid, when kneaded did not clump but remained dissolved, the smell was not pungent and musty like kohe, not foamy,

blackish-brown and bright and homogeneous (the form of animal manure and feed debris was no longer visible).

In terms of physics, the organic fertilizer products produced are presented in Figure 2.

Table 3. Nutrient content of organic fertilizer produced by farmers participating in community service program training in Otak Pancor Utara kampong, Lendang Nangka Utara village, Masbagik, East Lombok, NTB

| Nutrient content | Nutrient content in four sample of partner farmers | | | | Average | Standar SNI ^{1/} | Description |
|------------------------------|--|--------|--------|--------|---------|---------------------------|-------------|
| | P1 | P2 | P3 | P4 | | | |
| C-organic (%) | 32.00 | 30.00 | 28.00 | 26.00 | 29.000 | 9,8 - 32 % | Good |
| N total (%) | 0.98 | 0.92 | 0.87 | 0.96 | 0.933 | Min. 0,4 % | Good |
| C/N ratio (%) | 22.54 | 26.32 | 27.44 | 28.14 | 26.110 | Min. 10 % | Good |
| P available (ppm) | 186.74 | 132.44 | 302.76 | 244.82 | 216.700 | Min. 0,1 ppm | High |
| Available K (ppm) | 137.12 | 138.92 | 96.73 | 142.74 | 128.878 | Min. 0,2 ppm | High |
| KTK 100 g soil ⁻¹ | 48.64 | 47.84 | 52.42 | 56.24 | 51.285 | 24,0 - 45,0 | Good |
| Moisture content | 22.44 | 24.74 | 25.01 | 21.33 | 23.380 | Maks. 30 % | Good |



Figure 2. Organic fertilizer feed that has undergone an airtight decomposition process for 28 days and is ready to be re-decomposed with Bio-EM4 decomposer (Upper left picture), quality organic fertilizer product products that are ready to be applied (Upper right picture), Growth and yield of pineapple in conventional cultivation (Lower left picture) Pineapple growth and yield after the application of organic fertilizer 25 tons ha⁻¹ plus NPK Ponska 100 kg ha⁻¹ (Lower right picture)

The application of organic fertilizer in direct assistance activities in the field (demonstration plot) turns out to have an effect on the improvement of the growth and yield of pineapple plants (Figure 2 bottom right). The evaluation was carried out on the observation of the growth and yield of pineapple plants. Better growth and crop yields cause the motivation, enthusiasm and enthusiasm of farmers to increase. The growth of pineapple plants is measured by the weight of fresh plant biomass per plant clump. Plant growth variables were observed when plants were 10 months old after planting (BST). Meanwhile, the variable of pineapple crop yield was measured from the total number of fruits, fruit weight per tuber (1 m²) observed at the time of harvest. The average and results of the calculation of the variation of plant biomass weight at the age of 10 BST and the yield of the plant at harvest for each treatment package are presented in Table 4.

Table 4. The effect of organic fertilizer application on the growth and yield of pineapple fruit in demonstration plot assistance activities in Otak Pancor Utara kampong, Lendang Nangka Utara village, Masbagik, East Lombok, NTB.

| Dosage of NPK Ponska Organic Fertilizer Application (ha ⁻¹) | Parameter Pengamatan | | | |
|---|------------------------|--|---|---|
| | Plant Height (cm) | Weight of fresh biomass (g-clump ⁻¹) | Total number of fruits (m ⁻² fruits) | Fresh fruit weight (g m ⁻²) |
| 0 ton PO + 500 kg NPK ha ⁻¹ | 33.125 a ^{1/} | 857.00 a ^{1/} | 13.25 a ^{1/} | 3522.00 a ^{1/} |
| 20 ton PO + 200 kg NPK ha ⁻¹ | 35.500 a | 860.00 a | 13.00 a | 3567.50 a |
| 25 ton PO + 100 kg NPK ha ⁻¹ | 36.250 a | 865.25 a | 13.75 a | 3572.00 a |
| 30 ton PO + 0 kg NPK ha ⁻¹ | 27.500 b | 702.50 b | 10.42 b | 2523.50 b |
| HSD _{0,05} | 3.9740 | 114.809 | 1.6667 | 35.2859 |

Source: Data is processed from the 2022 independent community service activity report. ^{1/}Remarks: Numbers in the same column followed by the same notation do not differ significantly in the HSD 5% test

The data in Table 4 shows that the application of organic fertilizer produced from Kohe and cow pen waste with the application of Bio-EM4 technology at a dose of 20 - 25 tons of ha⁻¹ plus the application of NPK Ponska fertilizer at a dose of 100 - 200 kg ha⁻¹, can be used as a substitute fertilizer for NPK, Urea, ZK and TSP

because the growth and yield of pineapple plants remain stable and can compensate for the growth and yield of pineapple on plots fertilized with high doses of NPK of 500 kg ha⁻¹. The average yield of plant height, the weight of fresh biomass of pineapple plants 10 months after planting (BST) and the weight of fresh fruit per tuber

(1m²) in the two treatments of organic fertilizer application were not significantly different compared to the treatment of NPK fertilizer application of 500 kg ha⁻¹. However, the growth and yield of pineapple plants in these three treatments were significantly higher than the treatment of 30 tons of ha⁻¹ organic fertilizer application without (0 tons ha⁻¹) of NPK fertilizer. So it can be stated that the application of organic fertilizer with a dose of 20 - 25 tons of ha⁻¹ coupled with NPK Ponska 100 - 200 kg ha⁻¹, in addition to being able to increase the yield of pineapple fruit in quantity, is also able to improve the quality of fruit based on uniformity of size and weight so that it is more attractive and easy to market. In the treatment of the application dose of organic fertilizer of 25 tons ha⁻¹ coupled with NPK Ponska 100 kg ha⁻¹, the total fruit that can be harvested reaches 137,500 ha⁻¹ fruits with a total fresh fruit weight of 35,720 tons ha⁻¹ (Table 4).

The frequency of pineapple harvest from one harvest a year⁻¹, to twice a year⁻¹. This result is in line with the report of Hazra et al. (2019), that the growth and yield of MD2 variety pineapple is increasing with the application of biological fertilizers and organic fertilizers from organic mineral raw materials, cow and chicken cow and chicken cow and cage waste. Ngawit et al. (2021), also reported that the application of organic fertilizers produced from kohe and cow barn waste with a dose of 25-30 tons ha⁻¹ on long beans, spinach, mustard greens and shallots as aisle plants on coconut stands can improve the soil fertility status of coconut plantations and the total yield of coconut plants in year 1. The application of organic fertilizer of 20 - 25 tons ha⁻¹ at the end of each cycle in the planting pattern of the series planting shallots, cayenne peppers, mustard greens, long beans and spinach is able to maintain the biological and chemical fertility status of the soil so that the yield of the five vegetables is not significantly different from the results obtained on the crop plots fertilized with 300 kg of urea ha⁻¹, TSP 150 kg ha⁻¹ and ZK 150 kg ha⁻¹ (Ngawit et al., 2023b)

Conclusion

The implementation of counseling, training and mentoring went smoothly and successfully, as evidenced by the level of participation and enthusiasm of farmers which was originally moderate and could be increased to high after the implementation of direct assistance in the field about making organic fertilizer and its application to pineapple plants. The knowledge and skills of farmers are increasing, as evidenced by the fertilizer produced based on SNI standards is classified as good quality. The organic fertilizer produced from this activity can be used as a substitute fertilizer for NPK,

Urea, ZK and TSP because the growth and yield of pineapple plants at the application dose of 20 - 25 tons ha⁻¹ plus the application of NPK Ponska 100 - 200 kg ha⁻¹ remains stable and can compensate for the growth and yield of pineapple on plots fertilized with high doses of NPK 500 kg ha⁻¹. The best growth and yield of pineapple fruits was obtained by applying organic fertilizer of 25 tons ha⁻¹ plus the application of NPK Ponska 100 kg ha⁻¹, with a total number of pineapples that can be harvested as many as 137,500 ha⁻¹ fruits and a total fresh fruit weight of 35,720 tons ha⁻¹.

This activity needs to be continued, especially socialization about the application of Bio-EM4 technology in organic fertilizer production. Organic fertilizers can be used as alternative fertilizers to overcome the problem of scarcity of inorganic fertilizers in pineapple cultivation. The dosage of organic fertilizer application produced from Bio-EM4 technology for pineapple plants is 25 tons ha⁻¹ plus NPK Ponska 100 kg ha⁻¹ as a local fertilizer, with the application time after tillage.

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