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Training and Assistance in Production of Industrial-Scale Bioslurry Compost Fertilizer to Overcome Fertilizer Scarcity in Puntukdoro Village, Plaosan, Magetan

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Abstract: *Through the Partner Village Development program, the Training and Assistance Program for Bioslurry Compost Fertilizer Production aims to empower farmer groups (Mulyo Sejati) and livestock groups (Maju Bersama) in Puntukdoro village, Magetan Regency (PPDM). This activity aims to make use of bioslurry waste (available at nearly 200 liters per day) and agricultural and livestock waste, which is abundant in industrially produced Bioslurry compost. The method used in this community empowerment activity is the ABCD (Asset-Based Community Development) approach. From April to December 2021, this activity lasted for eight months. This activity resulted in a map of partner assets, increased partner knowledge of using bioslurry waste, agricultural waste, and livestock (with a 75 percent understanding rate), and increased partner income through profit from production and commercialization. The total revenue generated by partners in a single production cycle is 7.5 million dollars.*

Introduction

Fertilizer is one of the highest factors affecting success in agricultural productivity[1]. The increasingly high need for fertilizer in Indonesia causes its availability in the field to be limited[2]. Many farmers in the regions are experiencing a shortage of fertilizer supply due to subsidized fertilizer distribution which often experiences delays [3]. Facts show that the implementation of subsidized fertilizer programs for farmers still experiences many obstacles, including the existence of illegal fertilizer exports, the

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[2] Imam Mujahidin Fahmid et al., "Study of the Impact of Increasing the Highest Retail Price of Subsidized Fertilizer on Rice Production in Indonesia," *Open Agriculture* 7, no. 1 (January 1, 2022): 348–359.

[3] Vidyanita Vivi, Fefta Wijaya Andy, and Rochmah Siti, "Kinerja Birokrasi Dalam Penyaluran Pupuk Bersubsidi Di Kecamatan Jombang," *Ilmu Sosial dan Ilmu Politik* 5, no. 1 (2016): 74–85.

absence of supervision on the domestic fertilizer market so that there are many subsidized fertilizers that are not on target, besides that they are also not effective and efficient [4]. This condition also occurs in Magetan district. Many things need to be addressed in the agricultural sector in Magetan Regency, especially Plaosan district, one of which isthe improvement of the upstream subsector of horticultural farming, including the provision of superior seeds and fertilizers and medicines. [5]

Puntukdoro Village is a partner and assisted village of PGRI Madiun University, the implementation team has carried out community service with the application of cellulolytic mold for biogas production[6]. This is done to convert livestock waste that was previously still disposed of into rivers and as an effort to utilize abundant vegetable waste into biogas[7]. Biogas is a flammable gas produced through anaerobic fermentation of organic matter[8]. All kinds of organic substances can be processed to produce biogas, but only homogeneous organic substances (solid, liquid) such as cow dung and cow urine are suitable for simple biogas systems. This biogas is environmentally friendly bioenergy that can reduce CO_2 emissions.[9][10]. The use of organic waste such as vegetable waste in Puntukdoro village as an additive in biogas production is an effort to convert organic waste to be more ready if used as compost. As is known that organic waste such as vegetable waste, agricultural waste and waste containing cellulose cannot be used directly in agriculture as compost because of the high C / N content[11][12].

In 2020, the implementation team assisted in the form of a biogas reactor with a capacity of 4000 liters which can be used for 3 households. From the biogas reactor, solid and liquid bioslurry waste is produced daily with a volume of 200liters / day. In addition, the implementation team also provided a cellulolytic microbial formula from the implementation team's research as an additional formula for optimizing biogas

[4] Agus Dwi Nugroho et al., "DISTRIBUSI PUPUK BERSUBSIDI DI KABUPATEN BANTUL PROVINSI DAERAH ISTIMEWA YOGYARTA," *Agrisocionomics: Jurnal Sosial Ekonomi Pertanian* 2, no. 1 (2018): 70.

[5] Sigit Dwi Kuncoro, "Pengembangan Wilayah Berbasis Subsektor Pertanian Hortikultura Di Kecamatan Plaosan Kabupaten Magetan," *Jurnal Wilayah dan Lingkungan* 2, no. 1 (2014): 43.

[6] Pujiati Pujiati, Nurul Kusuma Dewi, and Dimas Setiawan, "Pemanfaatan Limbah Tani, Ternak Dan Konsorsium Kapang Selulolitik Pada Produksi Biogas Di Desa Puntukdoro Magetan Melalui Program Pengembangan Desa Mitra," *Bubungan Tinggi: Jurnal Pengabdian Masyarakat* 3, no. 1 (2021): 33–41.

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production, especially those using agricultural organic waste.

Bio-slurry or what is often referred to as biogas pulp is a product of biogas processing in the anaerobic fermentation process. After exiting the outlet hole, the bio-slurry in the form of liquid tends to be solid, greenish-brown in color, does not / slightly emit gas bubbles and does not emit odors[13]. Based on the results of this bio-slurry has a lot of potential microbial content that can be used for soil fertility and agricultural crops. This is due to the high organic content in bio-slurries, the existence of microbial consortia such as probiotic microbes that help fertilize the land and control diseases in the soil, 2) tic oil cellul microbesthat have the potential to degrade organic matter, (3) nitrogen-fixing microbes as penangkap and p nitrogen availability, (4) microbial solvents Phospat solvents and providers of Phosphorus and (4) probiotic microbes that play a role in the control of soil infectious disease attacks.[14] [15] [16] [17]

Based on the background, and the analysis of local resources in Puntukdoro village, the implementation team carried out a community empowerment program for making bioslurry compost and its commercialization as a continuation of abdimas activities that have been carried out since 2020. The partners involved in this activity are farmer groups Mulyo sejati and Livestock groups Maju Bersama. The outputs that will be achieved from this community empowerment program include increasing farmers' knowledge and understanding of biogas waste management into commercial compost, increasing community income, reducing environmental pollution (rivers) in partner villages and meeting fertilizer needs independently to reduce dependence on chemical fertilizers.

Method

The method used in this community empowerment activity is the ABCD (Asset-Based Community Development) approach. [18]The assets in question include human resources, natural resource, physical, and financial assets[19]. The ABCD approach is

[13] Edi Supraptomo, "Pengaruh Aplikasi Bio-Slurry Cair Terhadap Pertumbuhan Bunga Kol (Brassica Oleracea Var . Botrytis L .) Varietas Dataran Rendah" (2018): 161–166.

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[19] Rifqah Fauziyah Natsir, "Aplikasi Konsep Asset Based Community Development (Abcd) Dalam

carried out to improve the welfare of partner village residents by identifying their assets to create a community empowerment system based on local wisdom[20]. The main points in this community service activity are carried out into 4 main activities including 1) surveys conducted through interviews, and FGDs to identify existing assets and determine the right empowerment solutions; 2) conducting socialization and training to improve citizens' understanding both in theory and practice in the development of potential existing assets; 3) Assistance as an effort to reduce the gap in understanding between partners and the implementation team in implementing the program; 4) Monitoring which aims to monitor the implementation of activities and identify problems after the application of technology; 5) Evaluation as an effort to reflect and determine strategies to overcome solutions to problems that arise during the implementation of activities.

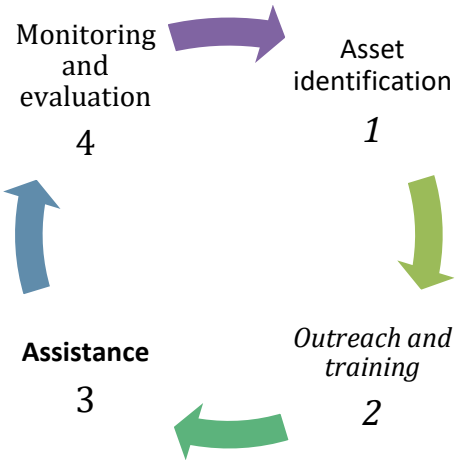

Figure 1. Program implementation diagram

Result

The implementation of community service activities starts from May to September 2021. The details and results of each activity are as follows:

Initial survey and coordination

The initial survey is carried out to identify the problems, assets owned, and views on the technology to be applied. This initial survey activity was carried out online using

Meningkatkan Cakupan Sanitasi Total Berbasis Masyarakat (Stbm) Di Kampung Bokara Kelurahan Banyorang Kecamatan Tompobulu Kabupaten Bantaeng Tahun 2014," *UIN Alauddin Makassar* (UIN ALAUDIN MAKASSAR, 2014).

[20] Esti Novi Andyarini, Sarita Oktorina, and Hamim Rosidi, "Strengthening Self Capacity of Ex-Localization of Prostitution Community at Bangunsari Surabaya for Economic Independence through Asset Based Community-Driven Development (ABCD) Approach," *Engagement: Jurnal Pengabdian Kepada Masyarakat* 4, no. 2 (November 27, 2020): 278–297.

google meet during the pandemic. This survey was conducted several times followed by coordination to find solutions to existing problems based on the ABCD (Asset-Based Community Development) method. Based on asset identification data, it is obtained that partners have all the specified asset classifications including natural resources assets, HR assets, physical assets, social assets and financial assets. From identifying problems and available assets, real activities of the empowerment program are carried out. Based on the identification of existing assets, which are the assets of the abundance of natural resources assets which include livestock waste, agricultural waste and bio-slurry waste, furthermore, it is also supported by HR assets that are very proactive in processing bio-slurry waste into commercial compost, in addition to physical assets consisting of the availability of land for the establishment of compost houses as factories for compost production; social assets that include the ability and spirit of cooperation and high cooperation to overcome problems in the village, the character of partners who are very open with the adaptation and innovation of the latest technology, especially in agriculture; and financial assets including the ability of citizens to sell and buy agricultural support products, farmer partners from major industries both at home and abroad who are ready to receive local agricultural products.

The documentation of activities in this survey and coordination is presented in figure 2

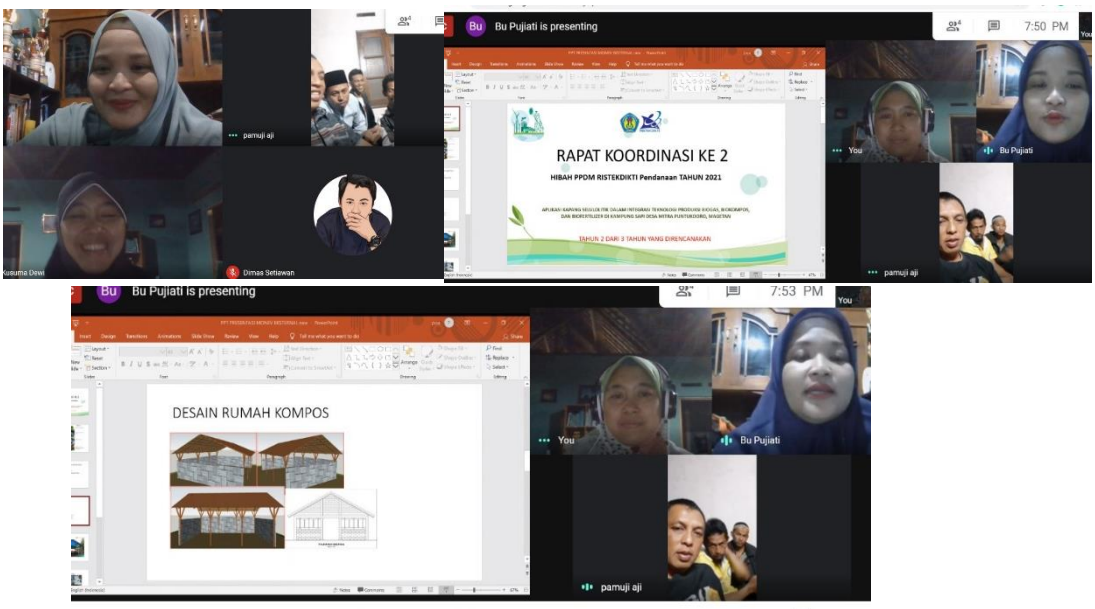

Figure 2. Survey activities, coordination, asset mapping and delivery of technological images provided to partners

Socialization and training on the production and commercialization of bio-slurry compost fertilizer

Socialization is carried out to increase the understanding of partner communities in the management of high bio-slurry waste into commercial products, how the design of compost house production is used, how it works, and how to make compost using bioslurry waste with the addition of a mixture of other ingredients and the use of the formula used. In this training, training was also given on how to commercialize fertilizers. The community is very enthusiastic about participating in this socialization and training. This can be seen from the residents' enthusiasm in discussing determining the location of bioslurry compost production and discussing in determining the jobdesc. Before this training activity, pretests and posttests are also given. The pretest and posttest results showed an increase in residents' understanding of the use of bioslurry waste with the highest level of understanding up to 69%.

Figure 3. Socialization and training activities for making industrial-scale bioslurry compost and its commercialization

Assistance in the establishment of compost houses

Assistance in establishing this compost house is carried out to monitor the suitability of the development with the concept and layout that has been determined from the beginning. Before the construction of this compost house, the implementation team had disseminated the concept and operation of the compost house, the construction of the compost house was carried out in cooperation by the partner group. The construction of a compost house from start to finish takes 40 days.

Figure 4. Assistance in the construction of Bioslurry compost production houses

Assistance in making microbial starters for the production of bio-slurry compost

One of the specialties and characteristics of this bioslurry compost product is the starter used, the starter used is a microorganism formula developed by the implementing team and propagated for the production raw materials. Partners have conducted training on how to propagate microorganisms. In addition to the quality has been lab-tested, this can also save production costs because it does not use a commercial starter.

Figure 5. Assistance in the construction of Bioslurry compost production houses

Assistance in the production of compost fertilizer.

Assistance in compost production is carried out once in the first production. This assistance is carried out to ensure the application of appropriate procedures and techniques so that the success rate is as expected. Mentoring can also increase the confidence of partners to run the program and even be able to change the mindset of the partner community, so intensive mentoring is very necessary for the success of the program. This assistance starts from enumeration of organic materials using a chopping machine, preparation of fermentation and material arrangement, aeration and drying processes until they reach moisture according to standards.

Figure 6. Assistance in the production of bioslurry compost

Harvesting and packaging assistance

Harvesting is carried out after two reversal processes then dredged until the fertilizer product is ready for packaging. At this stage, samples of finished compost are also taken to be tested for the content of NPK elements in the UNIPMA Biology laboratory. Compost fertilizer is packaged in bagor sacks that have been labeled "Bioslurry Compost Fertilizer" weighing 25 kg per sack. This first production harvest produced 373 sacks or 9,325 tons with a turnover of 7.5 million per cycle (6 weeks of production).

Figure 7. Harvesting and *packaging assistance*

Marketing assistance

Marketing assistance is carried out to assist partners in marketing Bioslurry compost products to be more widely known. Marketing is carried out by selling directly to farmers, promoting to agricultural shops, or promoting social media. The market response was very good within 7 days after the packaging of the first production of compost fertilizer has been completely sold. This assistance is very important because it can increase entrepreneurial motivation in partners. This assistance is also an effort to increase partners' confidence in the products they produce and foster enthusiasm to continue the business that has been run.

Figure 8. Marketing assistance

Program monitoring and evaluation

The entire process and stages in the production of Compost Fertilizer have run one cycle from preparation, production to marketing. For this reason, it is necessary to monitor and evaluate to find out the shortcomings and set a strategy and determine what steps should be taken for future improvement. This evaluation also involves the Village Head as the supervisor of the farmer group

Figure 9. Monitoring and evaluation

Discussion

Community empowerment is an activity or process to improve the ability or capacity of the community in utilizing their resources, including human resources (HR) and natural resources (SDA) available in their environment optimally to improve the welfare and quality of life of the local community. Community empowerment activities through training and assistance in the production of industrial-scale bio-slurry compost include: 1) initial survey and coordination; 2) Socialization and training on the production and commercialization of bio-slurry compost fertilizer Assistance in the establishment of compost houses; 3) Assistance in making microbial starters for the production of bio-slurry compost fertilizer; 4) Assistance in the production of compost fertilizer; 5) Harvesting and packaging assistance; 6) Marketing assistance; 7) Monitoring; 8) Program evaluation.

In the survey and coordination activities, data were obtained, including identifying partner assets and pretest data on partner understanding before applying technology. The data is presented in table 1 and table 2.

Table. 1 Asset *mapping* of partner villages

No	Asset Type	Information
1.	Natural Resources	Abundant agricultural and livestock waste because it is a vegetable production center, abundant bio-slurry waste (liquid slurry 200 liters / day, solid slurry
2.	Human Resources	Farmer groups and livestock groups as target partners
3.	Physical assets	Vacant land to be used for the erection of compost houses
4.	Social assets	Cooperation, cooperation, always innovating in agriculture
5.	Financial assets	Ability to sell and buy agricultural products and materials, farmer partners from major industries both at home and abroad who are ready to receive local agricultural products

Table. 2 Pre test

No.	Information	Number of Answers			
		Very understanding	**Understand**	**Quite understand**	**Don't understand**
1.	Understanding bioslurry and its potential	0,0%	0,0%	39,3%	60,7%
2.	understanding the use of bioslurry for agriculture	0,0%	0,0%	42,9%	57,1%
3.	Understanding the content contained in bioslurry	0,0%	3,6%	28,6%	67,9%
4.	Understanding of the use of bioslurry for the manufacture of compost	0,0%	3,6%	50,0%	46,4%
5	Understanding of compost houses	0,0%	0,0%	42,9%	57,1%
6	An understanding of industrial-scale compost production	0,0%	3,6%	28,6%	67,9%

Table. 3 Post test

No.	Information	Number of Answers			
		Very understanding	Understand	Quite understand	Don't understand
1.	Understanding bioslurry and its potential	75,0%	17,9%	7,1%	0%
2.	understanding the use of bioslurry for agriculture	64,3%	32,1%	3,6%	0%
3.	Understanding the content contained in bioslurry	71,4%	21,4%	7,1%	0%
4.	Understanding of the use of bioslurry for the manufacture of compost	60,7%	35,7%	3,6%	0%
5	Understanding of compost houses	64,3%	32,1%	3,6%	0%
6	An understanding of industrial-scale compost production	71,4%	21,4%	7,1%	0%

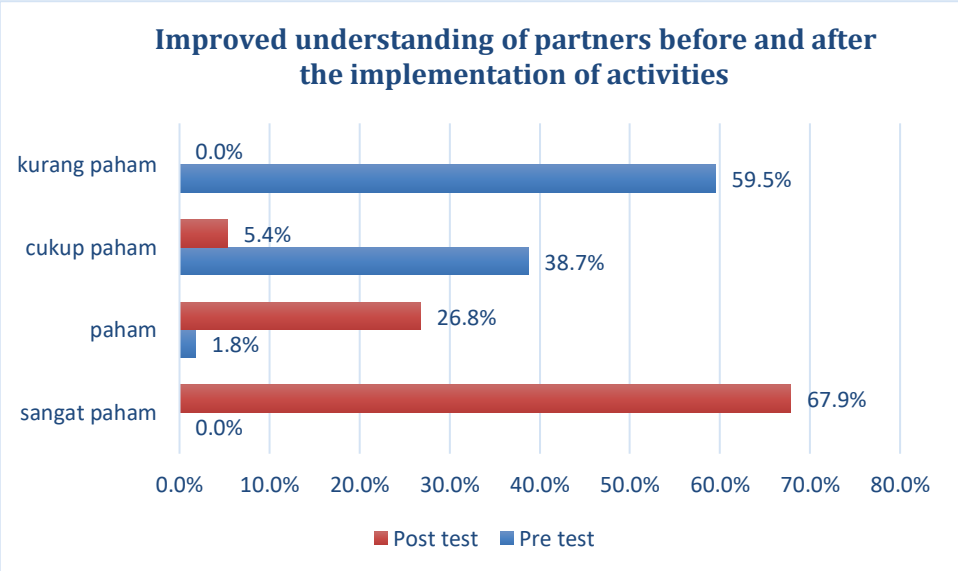

Figure 10. Graph Percentage of increased understanding of partners before and after training socialization

The mentoring carried out is also almost at every stage. This is done because coaching is a very important strategy to determine the success of community empowerment programs. The three basic principles of community assistance are: 1) Students come from the community, namely community empowerment comes from the community, is given by the community, and serves the community; 2) Companion as Facilitator, Community as Actor, that is, the facilitator needs the community as the main participant, while the companion is guiding; 3) Mutual learning and sharing of experiences, that is, public knowledge and external knowledge or innovative knowledge must be chosen wisely or complement each other.[21]

Conclusion

The results obtained from the implementation of Training and Assistance in Industrial Scale Bioslurry Compost Production to Overcome Fertilizer Scarcity in Puntukdoro village, Plaosan, Magetan are 1) the existence of a partner asset map; 2) increasing partner knowledge in utilizing bioslurry waste, agricultural waste and also livestock with a percentage of understanding reaching 75%, 3) increase partner income through profits derived from production and commercialization. The turnover earned by partners per one production cycle is 7.5 million. The things that need to be developed next are to carry out a mass promotion so that product sales increase.

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