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Strengthening and Empowering of Community Observer and User of Biomass Waste Utilization Facility in Tadukan Raga Village, Deli Serdang Regency

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ABSTRACT

Biogas is renewable energy that can be used as substitute of LPG and generator fuel. One of the uses of non-B3 biomass waste into energy has been implemented in Tadukan Raga village in Sinembah Tanjung Muda (STM) Hilir District, Deli Serdang Regency, which has been operating since 2018. This facility consists of a biogas producing unit and mushroom grumpy. This biogas unit is only capable of producing biogas which can be distributed to 20 points of the house, and the mushroom grumpy is also only limited to one type of mushroom, namely straw mushrooms. Apart from that, mushroom grumpy as a container for growing straw mushrooms is done by using empty oil palm bunches mixed with cow rumen. Therefore, the University of North Sumatra Community Service Institute conducted: (1) Operational training for biomass reactors through making starters to increase biogas production in facilities for utilizing non-hazardous biomass waste into energy (2) Addition of biogas piping networks and biogas stoves to nearby residents' homes. at facilities for utilizing non-B3 biomass waste into energy (3) Training on the decomposition of non-B3 biomass waste through the cultivation of straw mushrooms at facilities for utilizing non-B3 biomass waste into energy (4) Counseling on downstreaming of straw mushroom products at facilities for utilizing non-B3 biomass waste into energy.

Keyword: Biogas, Straw Mushroom, Biomass, Starter

1 Introduction

Deli Serdang Regency has 22 districts which as part of the east coast of North Sumatra Province are located between $2^0$57'' – $3^0$16'' North Latitude and $98^0$33'' – $99^0$27'' East Longitude with an area of 2.497.72 km^2. The area of Deli Serdang Regency is bordered to the north by Langkat Regency and Malacca Strait, to the south by Karo Regency and Simalungun Regency, to the east by Serdang Berdagai Regency and to the West by Karo Regency and Langkat Regency [1]. Deli Serdang Regency is one of the developed districts in North Sumatra Province with PAD Deli Serdang Regency including the largest in North Sumatra [2]. The community has a livelihood as oil palm farmers, horticulture as well as farmers of both cattle, goats, sheep, pigs, and poultry. One of the villages that has the potential to be developed in Deli Serdang Regency is Tadukan Raga Village.

Tadukan Raga Village, Deli Serdang Regency itself already has a non-B3 waste treatment facility in the form of TKKS into biogas. Currently, through the biogas plant facility, it has produced biogas that can be flowed to

20 points of the house using a biogas stove. In addition, the biogas plant facility also has a mushroom beetle facility that produces merang mushrooms in very good quantity and is ready to be marketed. In this case, the development of biogas manufacturing technology and the cultivation of merang mushrooms aims to increase production and develop technology, as well as marketing the resulting mushrooms. This optimization is expected to improve system and equipment performance as well as production efficiency so as to produce quality and good quantity biogas and mushroom products.

Optimization that can be done is by adding a starter where the starter can make more biogas production results and the process faster. Starter can be made by utilizing raw materials namely chicken intestines, fruit afkir, molasses and water. Chicken intestines can usually be requested to the seller of slaughtered chicken. Fruits that experience a little decay can still be used into something useful as a starter in making biogas because of the nutritional content that can still be used by microorganisms such as bacteria and fungi that play a role in the degradation process. In the starter the contents of the chicken intestines will enrich the population and types of microbes. Therefore, starter from the fruit and intestines of chickens can increase the diversity of bacteria that the substrate does not have, thus accelerating the biodegradation process.

The problem in biogas production is that it takes a relatively long time in the fermentation process and the amount of methane gas produced is also small. This problem can be solved by creating a starter that will be added in the fermentation process. The starter acts as an agent to speed up the composting process, increase the content of organic matter and the availability of nutrients. The use of starter in addition to accelerating the fermentation process and reducing waste load, can also suppress other microorganisms that are inhibitors of the fermentation process to be inactivated or even stopped. After the increase in biogas production is carried out, it is also necessary to add piping networks and biogas stoves. In addition, mushroom beetles as containers where mushrooms grow are carried out by utilizing empty oil palm bunches mixed with cow rumen. The mushrooms produced from this facility are only sold raw so the selling value is low and also rots quickly. Therefore, training on drying and packaging of merang mushrooms is needed for partner communities.

The purpose of empowering the community of biogas observer and user groups in Tadukan Raga Village, Sinembah District, Tanjung Muda Hilir Deli Serdang is the development of biogas manufacturing technology and the cultivation of merang mushrooms through the provision of studies, improvement of systems and facilities, and improvement of the quality of biogas and molt mushroom products. Ensuring the sustainability of operations and maintenance of non-B3 biomass waste utilization facilities into energy in Deli Serdang Regency. Improvement of biogas production plants derived from the cultivation of merang mushrooms in the utilization of non-B3 biomass waste facilities. Modifying the stove to be used from biogas manufacturing technology and cultivating molt mushrooms.

2 Method

The implementation of this service activity began with conducting surveys, socializing training participant selection activities, conducting training, increasing biogas and mushroom beetle production, and mentoring. The methods that will be carried out in the implementation of this service are:

a. Site Survey
   In the early stages of the activity, we have carried out an initial survey to obtain information in the form of the condition of biogas plant facilities and mushroom beetles, economic data of village communities and the potential for biomass waste and types of handicraft products that can and have been developed as well as data on public services that have been carried out in Tadukan Raga Village.
b. Focus Group Discussion
   The data obtained will be discussed together with village officials, LPPM USU team and managers, users and observers of biogas facilities through FGD (Focus Group Discussion) techniques to identify existing problems and determine alternative solutions to problems.
c. Implementation of Community Service Activities: Assisted Villages
   Carrying out Community Service activities in the form of developing biogas plants and 13 mushroom beetles. The activities to be carried out include: Making starters to increase biogas production, cultivating mushrooms, adding biogas piping networks and biogas stoves, and Counseling for Downstream Mushroom Products.

3 Result and Discussion

Currently, the consumption of non-renewable energy such as petroleum still dominates in Indonesia. Excessive use of fossil energy can lead to environmental pollution and depletion of energy reserves. One alternative to renewable energy as a substitute for fossil energy is biogas. Biogas has the potential as a power plant using a gas engine, where 1 m3 of biogas can produce electricity of 1.8 kWh equivalent to 25% of power plant efficiency. In realizing this, initial coordination will be carried out on August 31, 2023 Tanjung Morawa. During the meeting, the LPPM USU service team held discussions and conveyed the intention that USU would remain responsible for continuing biogas plant installation activities so that it could flow to the homes of Tadukan Raga villagers. From the results of the discussions conducted, it can be seen that the sub-district and village governments agreed to carry out this activity. However, in order for activities to run smoothly, the LPPM USU service team still has to coordinate the assisted village program in Tadukan Raga Village with the Environmental Office as the PIC (Person In Charge) of the biogas plant. The follow-up discussion was about identifying various problems in implementation related to community empowerment specifically in Tadukan Raga village. Based on the discussions conducted, it is known that there are several problems, namely if the construction of the previous biogas plant was not empowering the village community so that the construction of the biogas plant carried out seemed only to fulfill the project. Therefore, through the Tadukan Raga assisted village program implemented by the LPPM USU service team, it is hoped that the reactivation of biogas in residents' households can improve the quality of existing resources in Tadukan Raga village until then and be used by residents as an energy source to replace electricity and LPG gas so that it can anticipate the scarcity of fuel oil and can also be an effort to control environmental pollution.

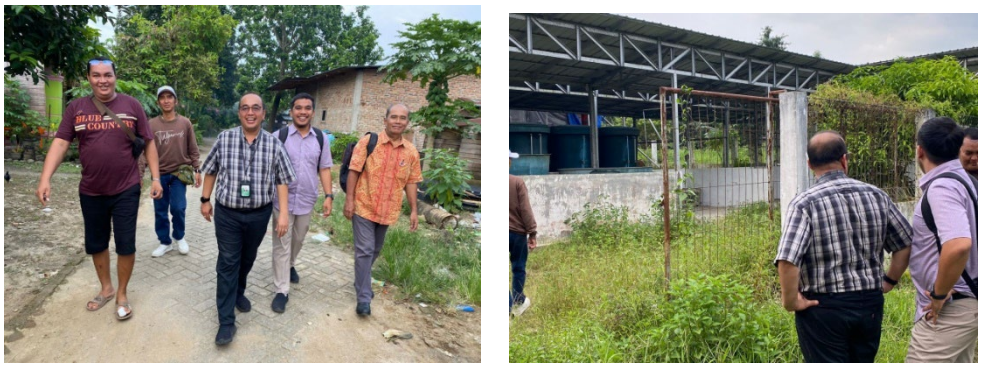

Figure 1. Initial Coordination with Partners on the Continuation of the Assisted Village Program in Tadukan Raga Village

After the field survey, land clearing was carried out which will be used as a biogas plant and mushroom beetle facility by the surrounding community. The cleared land can be seen in figure 2.

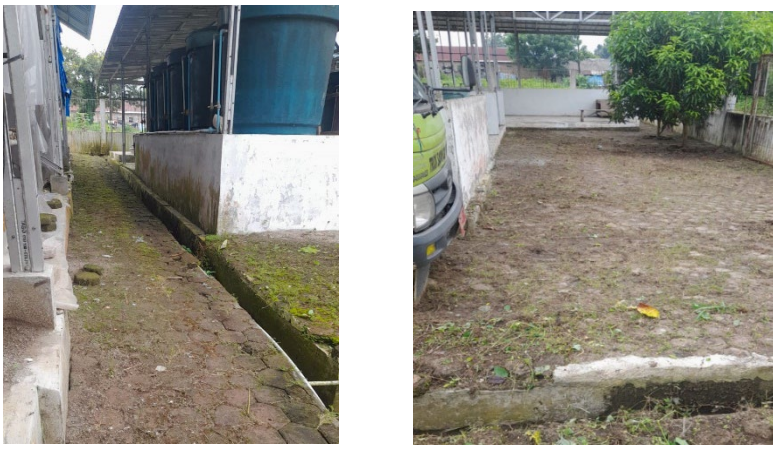

Figure 2. Locations Cleared by Nearby HR

In addition, a second coordination was carried out with partners regarding obstacles and challenges in activating biogas plants. This meeting discussed the current development of biogas plants. The village head and also the head of the hamlet explained about the condition of the biogas plant that occurred. It is known

that the use of biogas plants has not been felt by the community around Tagukan Raga Village. It was also mentioned that in the process of building the biogas plant, many obstacles and challenges were found.

Based on the results of the FGD that has been carried out, the next step in solving this problem is drawn, namely the need for a stage of facility development. Facility development in the form of increasing biogas production and mushroom beetle cultivation, such as determining the best ratio between EFB raw materials: preparation formulation and mushroom beetle planting media, and trainings in an effort to improve the quality of human resources, increase production, and improve management quality. After all data is submitted, then the preparation of tools, materials and materials during socialization and training can be seen in Figure 3.

Figure 3. Socialization of Biogas Plant Development Service

The LPPM team of the University of North Sumatra directly provided socialization and training to the people of Tadukan Raga village. Activities are carried out openly by directly seeing the entry of cow rumen raw materials into the bioreactor, the operation of biogas from the reactor to the stove that has been modified so that biogas can be used and function properly. From the socialization and training that has been carried out, partners get new insights in utilizing non-b3 waste as energy in the form of biogas. In addition, another benefit of this facility is the existence of beetles for the cultivation of molten mushrooms. Energy in the form of biogas produced from anaerobic composting of TKKS waste from mushroom media can be used by people who work as mushroom farmers as fuel for the mushroom sterilization process before packaging and marketing, while the compost produced can be used by the surrounding community as organic fertilizer. Socialization and training activities can be seen in Figure 4.

Figure 4. Photo with LPPM USU Partners and Team

Partners also participate in the program evaluation process to assess how well the program has been implemented, what impact has occurred after completing various program activities, and what needs to be improved or improved in the coming year. The partners are expected to be a reference in implementing self-sufficiency programs that can help solve the problem of organic waste and become an alternative source of new fish feed.

4 Conclusion

The service program was carried out well starting from meetings to continue cooperation with observer groups and the use of biogas in Tadukan Raga village, Sinembah Tanjung Muda Hilir District, Deli Serdang, site surveys, FGD activities, installation of service planks, to socialization and training activities. The service program is carried out enthusiastically by partners because partners get new interviews in overcoming organic waste problems in the village in an environmentally friendly way and has many benefits such as utilizing non-b3 waste as energy in the form of biogas, the existence of beetles for the cultivation of mushrooms, and mushrooms can be used by people who work as mushroom farmers as fuel for the mushroom sterilization process before being packaged and marketed, and the compost produced can be used by the surrounding community as organic fertilizer. It is hoped that this program will continue to grow and partners will make it a new and promising business opportunity that can boost the village economy while protecting the environment in Tadukan Raga Village.

5 Acknowledgements

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