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Economic Value from Biogas Technology Application Based on Dairy Cow Farming

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ABSTRACT

This study aims to analyze the economic value of the application of biogas technology based on dairy farming. The data analysis used a quantitative method with an approach to the value of biogas waste production. The results showed that 23.575 kg of livestock manure in Enrekang Regency was able to produce 688,390 m^3 / year of biogas production which was equivalent to 426,802 liters of kerosene so that annual savings of IDR 4.694.822.000 / year and the equivalent of 3 kg of Liquefied Petroleum Gas were IDR 2.111.062.667/year. Economically, it has been proven that the application of biogas installations is feasible as rural alternative energy.

Keywords : Biogas Technology, Economic Value, Dairy Farming

I. INTRODUCTION

Limitations and scarcity of the amount of energy derived from fuel oil that occurs cause oil prices tend to rise [1]. Utilization of biogas as an alternative energy source in addition to providing social benefits because it is environmentally friendly, but also must be able to provide economic benefits [2]. The production of biogas can control and reduce the problem of livestock waste, besides the energy produced can be used as cooking fuel. In addition, the by-product of biogas (sludge) can reduce the production costs of agricultural and livestock activities, namely as fertilizer and feed ingredients. Costs incurred for making biogas must be able to provide economic benefits, so it is necessary to know the feasibility aspects both technically and economically [3].

Modes of production in livestock waste processing in Enrekang Regency are still managed subsistently and commercially. This production mode plays an important role in helping to increase output per unit of labor through innovation and technology [4-6]. Therefore, it aims to analyze the economic value of the application of biogas technology based on dairy farming.

II. METHODOLOGY

This research was conducted from October 2020 to December 2020 in Enrekang Regency. This location was chosen deliberately because Cendana District is one of the centers for developing dairy cows and has the largest population in Enrekang Regency and has the opportunity to utilize biogas at household scale. This study uses data sources consisting of primary and secondary data. Primary data obtained through observation, interviews with farmers and the government using a questionnaire. Secondary data were obtained from the Center for the Assessment of the Process and Energy Industry, Central Statistics Agency, Statistical Data of the Enrekang District Animal Husbandry Office, research reports and publications from journals. Data were analyzed with quantitative data using an economic value approach from the application of biogas technology.

III. RESULTS AND DISCUSSION

3.1 Biogas Production in Enrekang District

Biogas development in Enrekang, South Sulawesi, is one of Indonesia's domestic biogas programs (BIRU) which was started in 2010. Biogas is a renewable energy source capable of contributing to the effort to meet fuel needs. The raw materials for this energy source are non-fossil materials, generally waste or livestock manure whose production depends on the availability of grass and grass will always be available [7].

Figure 1. Biogas From Dairy Cow

Figure 1 shows that the biogas installation process begins by making a digester/reactor area, temporarily accommodating dirt, providing four stirrers, a channel to the reactor, installing a gas pressure gauge and a biogas stove. The size of the reactor is adjusted to the amount of biogas potential and the location of the reactor. If the potential is large and it is located in a district, the reactor that is being built may have a minimum capacity of 20-30 cubic meters. Utilization of biogas from livestock feces is an effort to build a habit of using alternative and renewable energy sources.

The use of biogas from livestock manure has the following advantages: 1). Save on budget expenditures in purchasing Liquefied Petroleum Gas and kerosene. 2). Using biogas as fuel for cooking dangke, which is available at any time. 3) Making fertilizer from biogas waste which is very useful as a source of nutrition for plants. This type of fertilizer also contains less pathogenic bacteria. The results of this study are supported [8] - [12], Biogas is useful as an alternative energy source, plant growth is better after being fertilized by biogas waste due to pest attacks and fewer weeds. fermented manure and ecosystem balance to ensure sustainable agricultural activities in processing livestock waste, to improve environmental sanitation, and address household economic costs.

3.2 Economic Value of Biogas Technology Applications

The application of biogas technology in Enrekang Regency which has dairy farms can provide economic benefits if the proper design is carried out from a technical and operational perspective. Currently, the use of biogas as alternative energy has not been able to fully substitute conventional household energy. However, the use of biogas can actually result in nominal savings in the overall energy cost structure

[13]. The economic value of the use of biogas technology in Enrekang Regency can be seen in Table 1.

Table 1. Economic Values of The Application of Biogas Technology With Kerosene, LPG And Firewood

District	Gas production potential (m^3/day)	Gas production potential (m^3/year)	Equivalent to kerosene (liters)	Equivalent to Liquefied Petroleum Gas (kg)	Economic value of biogas applications (IDR)
Maiwa	2	730	453	336	2.238.667
Bungin	12	4.380	2.716	2.015	3.432.000
Enrekang	200	73.000	45.260	33.580	223.866.667
Cendana	828	302.220	187.376	139.021	926.808.000
Buntu Batu	116	42.340	26.251	19.476	129.842.667
Baraka	64	23.360	14.483	10.746	71.637.333
Anggeraja	284	103.660	64.269	47.684	317.890.667
Malua	20	7.300	4.526	3.358	22.386.667
Alla	164	59.860	37.113	27.536	183.570.667
Curio	46	16.790	10.410	7.723	51.489.333
Masalle	138	50.370	31.229	23.170	154.468.000
Baroko	12	4.380	2.716	2.015	13.432.000

Source: Primary data that has been processed, 2020.

Table 1 shows that the number of dairy cows in Enrekang Regency in 2020 was 943 heads. The potential for biogas that can be produced is 1.886 m3/day or 688.390 m3/year. The amount of biogas is equivalent to 426.802 liters of kerosene, so that if the price of kerosene per liter is IDR 11.000, the funds that can be saved per year will be IDR 4.694.822.000. In addition, the economic value that can be saved from the application of biogas technology if calculated with the equivalent value of 3 kg Liquefied Petroleum Gas is IDR 2.111.062.667/year. So that the application of biogas energy for rural communities who own livestock is the right solution to reduce fuel consumption from fossil fuels, in addition to that, 25 kg of fresh cow dung can produce 10 kg of solid organic fertilizer from biogas digester by-products which can be used for agricultural business or household vegetable garden. This is supported by [14] - [15]. Cow manure is the most efficient use as a biogas producer because every 10-25 kg of cow dung per day can produce 2 m3 of biogas. . Where the energy contained in 1 m3 of biogas is 4.7 kWh or can be used as 60 - 100 watts of lighting for 6 hours. 1 m3 of biogas can be used equivalent to 0.62 liters of kerosene and 0.46 kg of Liquefied Petroleum Gas.

Solid waste processing can contribute to IDR 1,800,000 to farmers. The income received by breeders generated by breeders is greater than the net income from selling cattle. The sales income of organic fertilizer is IDR 3,344,166/month by processing 2.500 kg/month or the equivalent of 30 tons in a year, cow dung is sold in 5 kg and 10 kg packages assuming it is acceptable to the market [16] - [17]. This is supported by the opinion of [18], which states that alternative biogas energy has a very real effect on household expenditure savings. According to [19]. the use of dairy cow dung for biogas installations provides benefits not only for household

needs but for productive economic and health activities. Productive economic activities include the growth of agro-industries made from milk raw, such as caramel, milk crackers, pasteurized milk, milk tofu. One of the successes that have an impact on people's income and economic improvement.

IV. CONCLUSION

The economic value that can be saved from the application of biogas technology is IDR 2.111.062.667/year. The economic value of biogas as an alternative fuel commonly used by households appears to be relatively large. Therefore, the economic benefits of biogas are not only obtained from its ability to produce fuel substitutes, but also its ability to produce a by-product in the form of manure. Therefore, the economic benefits of biogas are not only obtained from its ability to produce fuel substitutes, but also its ability to produce a by-product in the form of manure.

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