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FEASIBILITY ANALYSIS OF BIOGAS CHICKEN MANURE BUSINESS DEVELOPMENT
(CASE STUDY AT PT JATINOM INDAH FARM, WEST JAVA, INDONESIA)

(Analisis Kelayakan Usaha Pengembangan Bisnis Biogas Kotoran Ayam
(Studi Kasus di PT Jatinom Indah Farm, Jawa Barat, Indonesia))

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ABSTRACT

Gas based resource has been widely used by Indonesians on daily basis. As for cooking purposes, the use of gas in the form of LPG (Liquefied Petroleum Gas) that is distributed by the government has been considered as problematic due to the high price. On the other hand, the trend of converting to alternative energy is on the rise. Therefore, the opportunity of developing an alternative resource to replace LPG for cooking is highly demanded. Biogas is a fuel which is produced from the breakdown of organic matter such as animal manure or sewage. The highly flammable feature of methane can be utilized for cooking purpose. Biogas is cheaper than LPG and has a more reliable distribution channel. The aims of this research are to analyze the feasibility of a chicken manure biogas business in non-financial and financial aspects and to analyze the sensitivity level of the feasibility of a chicken manure biogas business. Based on financial analysis, business development at PT Jatinom Indah is feasible because it has value of NPV Rp 1 186 604 209 with NET B/C of 3,045, Gross B/C of 1,302 and IRR of 33%, with payback period 3 years and 1 month.

Key words : Biogas, chicken manure, alternative energy.

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INTRODUCTION

The rise of the price of oil and other fossil-based resources forces us to think more about alternative energies. Other than that, fossil-based resources are known to leave a high carbon footprint after being used in several industries and households. Among different technologies, solar energy is considered most effective even regarding to the environmental protection of plants. Visionaries think that biomass will probably convert solar energy best and will substitute all fossil energy resource in the future (Deublein and Steinhauser, 2011).

In Indonesia, majority of the people still rely heavily on fossil-based resources especially when it comes to cooking purposes. LPG or Liquefied Petroleum Gas is a flammable mixtures of hydrocarbon gases used as fuel in heating appliances, cooking equipment, and vehicles. In Indonesia, LPG is commonly used for cooking-purpose. In 2015, as much as 67,78% of Indonesians use LPG as their main resource for cooking (Statistics Indonesia, 2017).

The use of LPG is considered as highly problematic due to its high price and poor distribution. Among several variation of volume that comes with the tube to contain the gas, the most popular kind of LPG packaged in Indonesia is the blue 12 kilograms non-subsidized LPG and the green 3 kilograms which is subsidized by the government. Because of its cheaper price due to government subsidize, the 3 kilograms LPG is more likely to be bought by Indonesian people. This is clearly a problem because 1) the subsidized LPG is meant for family with a low income and 2) there is no fulfilling procedure that filter the buyer of this type of LPG. Therefore, the middle income or even higher income Indonesian people also bought it. Due to this situation government must put more state money to meet the demand of this product.

The 3 kilograms LPG is often complained about its unavailability in the market especially in some part of Indonesia. Indonesia is a highly archipelagic country with over than 16 000 islands. Even though to this point the government has not distribute it throughout the nation, the LPG scarcity is already happening in a lot of places in Indonesia. This problem of LPG scarcity is worsened by the fact that not only the low economy Indonesian is using this LPG.

One of the solutions towards this issue is converting to a more reliable, cheap, and yet eco-friendly resource such as biogas. Recebli *et al*. (2015) studied that using biogas as fuel can save energy costs about 0.35 $/m. Biogas is the type of gas that is produced by the breakdown of organic matter such as agricultural waste, manure, sewage, or food waste (Grant and Marshalleck, 2008). Biogas is produced through anaerobic process until organic mixture contain inside extract methane and carbon dioxide. Biogas can be used when it has reached the right mixture of both elements.

Blitar regency located in East Java, Indonesia. Blitar is popular as the central production of chicken eggs with population of laying hens of more than 15 213 000 in 2016 (East Java Animal Husbandry Service, 2016). The process of laying hen cultivation produces a side product in the form of manure. Without a proper countermeasure, chicken manure could bring a negative effect to the surrounding

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environment and the chicken itself. Therefore, there should be an effective way to utilize this material to prevent it from doing any harm. One of the ways to do that is by turning the chicken manure into biogas. The objective of this paper is to analyze the feasibility in non-financial and financial aspects by opening biogas business unit using chicken manure at PT Jatinom Indah Farm, Blitar, West Java, Indonesia.

RESEARCH METHODOLOGY

The data collected were carried out for 3 months, starting from February 6, 2017 to April 29, 2017. The research method used is business feasibility study analysis. The goal of this method is to know whether opening biogas business unit for chicken layer farmer is feasible to run. The aspects analyzed in this report are non-financial and financial aspects. Non-financial aspect is consisting of marketing aspects, social and environmental aspects, technical aspects, management aspects and legal aspects while financial aspect is a set of variables that indicate whether the company is benefiting financially from the business (Nurmalina *et al*., 2014). The variables that analyzed are Net Present Value (NPV), NET Benefit-Cost Ratio (NET B/C), Gross Benefit-Cost (Gross B/C), Internal Rate of Return (IRR) and Payback Period. We also analyzed the sensitivity of the business using switching value.

The data collected in this paper was obtained from various sources related to the development plan for waste management unit of turning chicken manure into biogas. The type of data obtained was divided into two types, namely primary and secondary data. Primary data obtained directly through interviews and observations. Secondary data were obtained through literature study using several references such as books, internet, scientific journals, fieldwork reports and government institutions.

RESULTS AND DISCUSSION

Based on the observations made in PT Jatinom Indah Farm, there are two production system that is implemented in the company which is open house and closed house. According to the production manager of PT Jatinom Indah Farm, implementation of biogas business unit is feasible to be implemented in a house that use an open house system. This is because the distribution of chicken manure from closed house is inefficient to do in daily basis. PT Jatinom Indah Farm has not installed a technology that allow the chicken manure to be delivered from the dropping place inside the closed house system to the outside. The table below shows the number of open house system in several locations that PT Jatinom Indah have.

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Table 1 The location of laying hen production with open house system

No.	Location Name	Quantity of Chicken House (unit)
1.	Belakang	10
2.	Buntung	27
3.	Gogodeso	15
4.	Jabon	25
5.	Sumberagung	19
6.	Soso	20
7.	Lontar	15

Source : PT Jatinom Indah Farm, 2017

Biogas is a low-grade, low-value fuel and therefore it is not economically feasible to transport it for any distance. Likewise, biogas cannot be economically trucked (Krich *et al.,* 2005). Therefore, the location of biogas plant should be relatively near human residence. Considering that chicken egg production often creates an unpleasant smell, most of the production location is placed relatively far from human residence. There are only three locations that in PT Jatinom Indah that meet the distance requirement to install the biogas plant which are Gogodeso, Jabon and Sumberagung. After considering which location is suitable to open biogas business unit, the next step is to analyze the feasibility of implementing the idea through non-financial and financial aspect.

Non-Financial Aspect

a. Marketing aspect

Figure 1 shows that the demand for energy source used for cooking is high and increasing every year. Therefore, the potential of establishing biogas business unit is positive.

Cooking is highly essential to complete day to day necessities. Therefore, the demand of energy source that is used for cooking is one of human basic needs. The market for biogas is as wide as the market for LPG. In 2015, the number of LPG consumption in East Java is 1 307 760 Metric Ton. The picture below shows the increase of LPG consumption in East Java from 2011 to 2015.

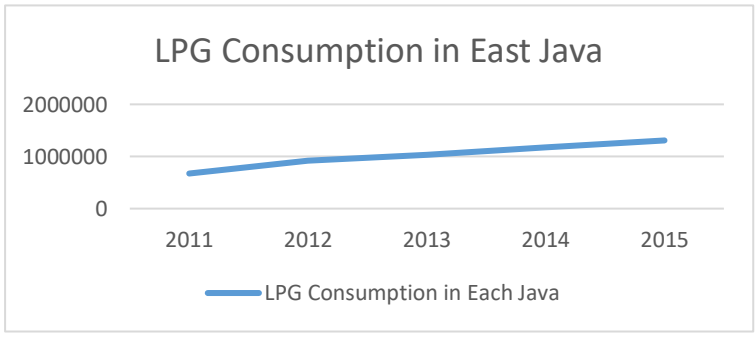

Figure 1 Demand for LPG in East Java
(Source: Statistics Indonesia, 2015)

b. Technical aspect

The number of households surrounds the three locations where the biogas business development will be implemented is counted at 84 houses for each location. Thus, the collective amount for this business development is 252 households. The average household use 1,3 m^3 of biogas each day so PT Jatinom Indah Farm must produce at least 327,6 m^3 of biogas every day. One kilogram of chicken manure can produce 0,065 – 0,116 m^3 biogas (Reid, 2005). To meet that demand, the amount of chicken manure that will be use is 2 824 kilograms every day. The population of chicken in each location is more than enough to supply that demand. The process of producing biogas will create a by-product in the form of organic fertilizer. The fertilizer yield will depreciate 28% in mass compared to the mass of the chicken manure when it first inserted to the biogas plant.

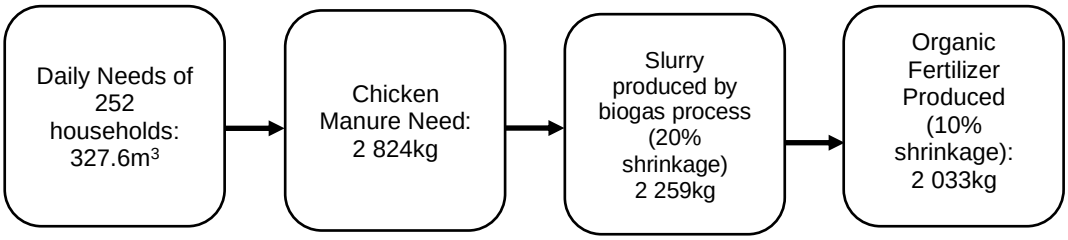

Figure 2 The process of chicken manure into biogas

c. Managerial aspect

The business development will use functional type of organization, meaning that the division will be divided according to the managerial function. Employee with the same skill set will be put in one specific division. To establish the biogas business unit, PT Jatinom Indah Farm will have to hire 13 more employees. One employee will be the field coordinator and 12 others will be spread in each location to do routine production process. In favor of gaining an appropriate social place within the surrounding community, PT Jatinom Indah Farm will hire people from around the location who need having a job.

d. Collaboration Aspect

In pursuance of having a positive start, PT Jatinom Indah is required to collaborate with existing resources and institution. From the technological point of view, PT Jatinom Indah Farm can form a partnership with BIRU which stands for “Biogas Rumah” (Household Biogas). BIRU can provide insights about building a proper biogas plant as well as training the production employee on how to properly maintain the technology that is being used. From political standpoint, PT Jatinom Indah Farm can work with government through Animal Husbandry Service (Dinas Peternakan) in providing the appropriate legal necessities in establishing a biogas plant.

Financial Aspect

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a. Basic Assumptions

1. The business lifetime is 10 years.
2. The amount of discount rate used is 4,5%, according to deposit rates of Mandiri Bank.
3. The price is Rp 1 600/m^3 for biogas and Rp 500/kg for organic fertilizer.
4. The tax regulation that is being used refers to Constitution of the Republic of Indonesia (UUD) number 35, Year 2008 on income tax, article 17 paragraph 2a. According to this regulation, the tax that should be paid is 25% of net profit before tax.

b. Cashflow Analysis

The result of cashflow analysis regarding to this business development plan comes with a set of variables that determines whether the business is feasible to run. Table 2 below shows the result of the cashflow analysis.

Table 2 Feasibility variables in biogas business unit establishment

Variables	Result
NPV	Rp 1 186 604 209
NET B/C	3,045
Gross B/C	1,302
IRR	33%
Payback Period	3 years and 1 month

1 NPV

The NPV value for the development of this business is Rp 1 186 604 209 which means that in the assumed business lifetime, this business can raise Rp 1 186 604 209. The feasibility requirement for this variable is above 0 which means this business is feasibly to run.

2 NET B/C

The NET B/C value of this business is 3,045 meaning that for every Rp 1 of net lost from the company will bring a net benefit worth of Rp 3 045. The feasibility requirement for this variable is above 1, therefore this business is feasible to run.

3 Gross B/C

The Gross B/C value of this business is 1,302 meaning that for every Rp 1 cost that the company spend will bring Rp 1 302 gross benefit. The feasibility requirement for this variable is above 1, therefore this business is feasible to run.

4 IRR

Internal Rate of Return is a variable that shows the discount rate in which the NPV of this business is zero. If the result of this variable is above the discount rate, the business is feasible to run. The IRR value for this business development is

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33% which is higher than the discount rate (4,5%). Therefore, this business is feasible to run.

5 Payback Period

Payback period is the amount of time in which the business can repay the investment cost to establish the business. A business is feasible to run if the payback period value is lower than the assumed business lifetime. The payback period for this business development is 3 years and 1 month while the assumed business lifetime is 10 years. Therefore, seeing from the payback period, this business development is feasible to run.

6 Switching Value Analysis

Switching Value Analysis determine to which point a business can withstand the changes in one variable. Based on the result of finding the switching value of several variables, there are two variables that is needed to be noticed, which is the decrease of demand in biogas and the decrease of chicken manure supply. The sample below shows to what point the business can tolerate these the decrease of this variables.

Table 3 Switching value result

Variables	Switching Value
Decrease of biogas demand	31,335%
Decrease of chicken manure supply	28,332%

According to the table above, the biogas business unit can tolerate the change in biogas demand until it reaches the decrease of 31,335%. The tolerance limits to the decrease of chicken manure supply slightly more sensitive which is 28,332%. If the business pass through this percentage in each variable, the business with start having a deficit income.

There are several ways that PT Jatinom Indah Farm can do to prevent the changes in each variable. PT Jatinom Indah Farm should maintain a good relationship with the customer by providing them a good and fair service. Other than that, the company should pay attention to the life cycle of each house and make sure that there is no gap in which the chicken manure is not produced.

CONCLUSION

Based on the non-financial and financial aspect analysis of this business development plan, all of the aspect meets the feasible requirement. PT Jatinom Indah Farm will distribute biogas to 252 households every day. The supply for the main ingredient in creating biogas which is animal manure is sufficient according to the production rate of chicken manure in PT Jatinom Indah Farm. Based on financial analysis, business development at PT Jatinom Indah is feasible because it has value of NPV Rp 1 186 604 209 with NET B/C of 3,045, Gross B/C of 1,302 and IRR of 33%, with payback period 3 years and 1 month.

PT Jatinom Indah Farm should not overlook the decreasing rate of biogas demand and the decreasing rate of chicken manure supply. Based on the result from switching value analysis, biogas business unit will be able to withstand 31,335% decreasing rate of biogas demand and 28,332% decreasing rate of chicken manure. PT Jatinom Indah Farm should pay attention to their chicken manure supply through the life cycle of laying hens in each location.

REFERENCES

Deublein D, Steinhauser A. 2011. Biogas from Waste and Renewable Resources: An Introduction. John Wiley & Sons. USA.

East Java Animal Husbandry Service. 2016. Laying Hens Population in Blitar Regency. www.disnakjatim.go.id

Grant S, Marshaleck A. 2008. Energy Production and Pollution Mitigation from Broilers Houses on Poultry Farm in Jamaica and Pennsylvania. International Journal for Service learning in Engineering 3 (1): 41-52.

Krich K, Augenstein D, Batmale J, Beneman J, Rutledge B, Salour D. 2005. Biomethane from Dairy Waste, a Sourcebook for the Production and Use of Renewable Gas. Western United Dairymen. USA.

Nurmalina R, Sarianti T, Uswandi AK. 2014. Business Feasibility Study. Institut Pertanian Bogor.

Recebli Z, Semili S, Ozkaymak M, Gonc O. 2015. Biogas Production From Animal Manure. Journal of Engineering Science and Technology Vol 10, No.6.

Reid T. 2005. The Feasibility of An on Campus Biogas Operation at The University of Waterloo. The Royal Veterinary and Agricultural . University of Waterloo. P.1-47.

Statistics Indonesia. 2015. Mining and Oil Statistics. www.bps.go.id.

Statistics Indonesia. 2017. Households percentage according to main resource for cooking purpose. www.bps.go.id.