Utilization Of Cow And Organic Waste As Organic Waste Empowerment Solution

Anggraeni Yunita¹, Karmawan², Sumar³
¹Accounting Department, Economy Faculty, Bangka Belitung University, Integrated Campus of UBB Balunijuk, Bangka Belitung, Indonesia, 33172
²Accounting Department, Economy Faculty, Bangka Belitung University, Integrated Campus of UBB Balunijuk, Bangka Belitung, Indonesia, 33172
³Management Department, Economy Faculty, Bangka Belitung University, Integrated Campus of UBB Balunijuk, Bangka Belitung, Indonesia, 33172
Email: anggi21.ay@gmail.com

Abstract. Bukit Kijang Village is one of the villages that is classified as young in the Namang Bangka Tengah District. one of the flagship programs of the Bukit Kijang village, which is farm-based agriculture on ex-mining land. To achieve the success of the program, it is necessary to make appropriate solutions for waste management to support the progress in agriculture. Village farms have 9 adult cows and 1 turtle calf so that cow dung produced is quite a lot. To overcome the problem of cow waste and household waste, one step is by making biogas from cow dung which can also produce solid and liquid fertilizer and utilization household organic waste in making biofertilizers. Mentoring activities were attended by Ladies of Family Welfare Empowerment, villagers and village youth groups. Both products produced are less than perfect due to equipment leakage and lack of shelf life so that the biogas and biological fertilizers that are formed are not perfect. So can't to test the products.

Keywords: Cow Dung; Organic Waste; Biogass; Biological Fertilizers

1. Introduction

Bukit Kijang Village is one of the villages in Namang Subdistrict, Central Bangka Regency which has an area of 813,188 ha with a population of 1,145 people and is still classified as a young village or a new village. The village is divided into two hamlets, namely Hamlet of Bukit Lesung and Hamlet of Batu Kijang. The majority of communities in the two hamlets work as farmers and miners. The large amount of mining activity in the Bukit Kijang Village area causes unproductive land so that one of the village's flagship programs is developing agriculture that correlates with livestock in post-mining areas. The correlation is intended as a step to repair the soil due to mining activities.

The program is supported by the existence of village livestock facilities, namely cattle farming, but the cow manure is still not optimally utilized. Cow manure is only managed by one person in charge and is only used in making compost to improve the texture of the former land of the mine before planting. In some cases cow manure has many benefits apart from being a basic ingredient in composting, cow manure can also be used as an alternative energy-producing material such as electricity and gas. The gas produced from cow dung or other organic material is called biogas. Biogas is a gas produced from the fermentation process of organic materials. This gas comes from various types of organic waste such as biomass waste, human waste, animal waste can be used as energy through anaerobic digestion process [8].

The next target is the utilization of household organic waste in the manufacture of liquid compost or biological fertilizers aimed at housewives as a step to develop household scale farming or home garden gardens. Making this biological fertilizer can play a role in reducing household waste pollution while changing the mindset of the community in the utilization and empowerment of organic materials. The activity of utilizing organic waste has been running in several advanced villages in Indonesia, especially in the Java region and has a positive impact of creating chemical-free vegetable farming which can also reduce production costs in the agricultural sector [5].

The lack of awareness of Bukit Kijang Village community towards the empowerment of organic waste both livestock waste and organic waste encourages the idea of inviting the Bukit Kijang Village community to develop village potential in agriculture and animal husbandry so that synergies between rural agriculture and livestock may result in an economic impact village. Especially the development in agriculture and the utilization of cow manure so that it can produce economically valuable products.

Biogas is an alternative energy source. Biogas is a gas formed because of anaerobic fermentation process from waste or waste materials and other organic materials. To produce biogas, a
Biogas reactor (digester) is needed which is an airtight installation so that the process of decomposition of organic matter can run optimally [10]. Biogas is a mixture of gases produced by methanogenic bacteria that occur in materials that can decompose naturally under anaerobic conditions. Biogas is odorless and colorless and when burned, it will produce a bright blue flame like LPG gas [1].

Biogas is a collection of several gases produced by organic materials through anaerobic fermentation process. Biogas has the main content of methane and carbon dioxide but also contains other gases. Natural gas is a gas consisting of several gas elements that have different chemical compositions. The biogas composition produced by anaerobic processes includes methane (CH₄), carbon dioxide (CO₂), several inert gases, and sulfur compounds. Methane is a gas derived from natural gas that can be burned [3]. Biogas technology with the concept of zero waste (not produced by waste) is expected to help slow the pace of global warming. In addition to being able to become alternative energy, biogas can also reduce environmental problems, such as air pollution, soil pollution and global warming [9].

The utilization of manure can be an easy alternative for the Bukit Kijang Village community in overcoming the need for electrical energy and also the need for LPG gas. Three cows can produce biogas which can be used in cooking, heating water and also as a source of electricity for petromarks. In addition, the use of biogas is also safer than using synthesis gas. This is because biogas has lighter and volatile molecules that reduce the risk of fire and explosion [8].

Biogas production is also relatively easy, the main ingredients used are cow dung and water with a ratio of 1:1 and fermented in anaerobic digester. Digester is an oxygen impurities compost device so that methanogenic bacteria can produce methane gas from cow dung. Besides being able to produce biogas, the use of biodigester can also produce byproducts in the form of liquid compost and solid compost, so that it can support in agriculture [8].

Waste is waste material that is not wanted after the end of a process or activity. Waste is a source of environmental pollution because it causes unpleasant odors, can pollute water, soil and is seen as aesthetically reducing the beauty of the environment. Household waste such as leftover vegetables and rice water laundry can be used as basic ingredients for making compost and biological fertilizers. The remains of vegetables in household waste are nutrient-rich organic waste needed by plants. Therefore, the remaining vegetables can be used as basic ingredients for making biological fertilizers. Vegetable waste is also a material that is easily decomposed by microbes so that the required process does not take long. Vegetable waste in biological fertilizers acts as a source of microbes which is one of the important components in organic fertilizer solutions (Retro, 2009). The use of waste is done by making it a new thing that is very useful. One effort to utilize the waste is to make it compost. The composting process in order to run faster and more efficiently is done by adding microorganisms to the organic matter or activator and supporting materials by utilizing rice washing water [7].

Waste of rice water laundry itself plays a role in producing carbohydrates in making biological fertilizer solutions. Milk-white rice washing water, it indicates that the protein and vitamin B1 that is abundant in rice are also eroded. And then vitamin B1 is used to reduce stress on plants after transferring media and spurring plant root growth [6]. This is in line with the results of previous studies which stated that used rice washing water can stimulate the growth of Adenium roots. The benefits of rice washing water have also been studied by Leonardo (2009), the first washing water of rinse rice has an effect on increasing the number of leaves and height of tomato and eggplant plants. One of the contents of rice laundry water, namely phosphorus which is a macro nutrient that is needed by plants [4].

Brown rice washing water contains calcium, iron and vitamin B1 nutrients which are greater than white rice washing water, while white rice washing water has higher nutrient content of nitrogen, phosphorus, magnesium and sulfur than brown rice washing water. The difference in nutrient content is noticeable in sulfur (S) nutrients. The content of S in brown rice washing water is 0.005% while in white rice washing water is 0.027%. Sulfur in plant metabolism has a role in protein synthesis and part of the amino acids cysteine, biotin and thiamin. Sulfur helps stabilize protein structure, helps oil synthesis and chlorophyll formation, and reduces disease attacks in plant bodies [11].

The use of organic waste or organic household waste can encourage housewives in Bukit Kijang Village to make a product that has economic value and also supports agricultural activities at household scale. The other positive impact is to provide selling value to organic waste which has been made as liquid organic fertilizer, adding value to organic waste, and can reduce the dependence of farmers on the use of chemical fertilizers [2]. The making of this biological fertilizer is also relatively simple and easy, the organic waste used will be fermented in an anaerobic composter with the help of the Effective Microorganism EM-4 activator. Simple and easy making is very possible to be carried out by the community including housewives [11]. The empowerment of organic waste in fertilizer production also contributed to the development of household agricultural programs in Bukit Kijang Village and reduced production costs in rural agriculture.
2. Methodology

The activity was held in Bukit Kijang Village which lasted for 4 weeks and was divided into 4 stages of activities, namely:
1. The first stage is making a digester and composter tool
2. The second stage of socialization
3. The third stage is assistance with direct practice methods
4. The fourth stage of evaluation of results

3. Results and Discussion

3.1. Tools and Materials

The tools used are simple biodigester consisting of gallons, 1/2 inch paralon pipes, ¼ inch water hoses, gas taps, clamps, inner tubes, plastic glue, black paint, and order. Another tool is the composter which consists of a water drum, 1 inch paralon pipe, 1/2 inch paralon pipe, filter / viber, connecting pipe Y pipe cover, water tap, and plastic glue.

The materials used are cow dung waste, water, household organic waste (leftover vegetables, banana peels, bamboo humps, eggshells, fish scraps, etc.), rice washing water and EM-4 activator (Effective Microorganism).

3.2. Dissemination and Direct Making of Biofertilizer by Ladies of Family Welfare Empowerment in Bukit Kijang Village

The dissemination was held in front of the village office, with a total of 20 participants who were members of the Ladies of Family Welfare Empowerment in Bukit Kijang Village. The dissemination began with the presentation by the presentator about the steps and importance of the separation of organic and inorganic waste. This dissemination invites Ladies of Family Welfare Empowerment to foster a sense of care in processing waste according to the type of waste by increasing important functions in sorting waste before being utilized. Even though the organic and non-organic waste systems have been implemented, however, in reality residents, especially the women of Bukit Kijang Village, still find it difficult to separate or dispose of waste according to the type of waste. They tend to still mix organic and inorganic waste so that the waste is difficult to recycle. The activity continued with the delivery of material that was more focused on organic waste, namely the use of organic waste in making fertilizers. In addition to socialization, participants were also invited directly or directly involved in making biological fertilizers so that there was interaction between participants and speakers.
Figure 2. Making Biofertilizers That Directly Engage Participants

The making of biofertilizer starts with making an activator by mixing EM-4 (Microorganism Effectivity) as much as 2 tablespoons into 1 liter of rice washing water then adding 250 gr of white sugar as a source of energy or microbial glucose. To be more effective activators should be stored first for 3-4 days until the color of the water turns clear and smells of tape, but can also be used directly. Household vegetables or organic waste are then chopped to speed up the rate of fermentation or composting by bacteria and put into the composter. The waste that is already inside the drum is then doused with rice washing water which has been evenly mixed with EM-4. The drum is closed tightly and stored in a cool place for up to 2 weeks.

The direct interaction or involvement of participants in making biofertilizers shows that participants gave a positive response to this activity, and also with the involvement of participants in making fertilizers directly can make it easier for participants to understand the steps to make biological fertilizers so that they can be practiced directly at home. Liquid biofertilizer produced at home can be applied to household crops or home gardening so as to reduce dependence on chemical fertilizers, harvested vegetables are free of chemicals and reduce production costs.

3.3. Making Simple Biodigester Tools

Figure 3. Simple Biodigester Tools

Making biodigester in producing biogas is quite easy, first of all gallon is given a hole in the side of the gallon neck and 2 holes in the side of the gallon body are 1 cm from the hole in the gallon neck. Each hole faces vertically and horizontally which will be filled with 1/2 inch paralon pipes which inside the gallon form the letter T. The hole in the gallon neck is then inserted an ¼ inch water hose connected to the Y connecting pipe and reinforced with a clamp. The left side of the hose is connected to the inner tube and the other part is connected to the gas tap. The digester that has been finished is then painted black to block the light from entering the gallon.
3.4. Socialization and Making Simple Biogas by Residents and Youth Organization in Bukit Kijang Village

The socialization of biogas was carried out in the village yard with 30 people consisting of ordinary residents and village cadets. This socialization was carried out with the aim of first presenting the targets from preparation to biogas production. In the socialization, it was also explained how to make a digester and the type of digester. In addition, the advantages of biogas and benefits for the community are also explained.

![Figure 4. Biogas socialization in Bukit Kijang Village](image)

The activity continued with the manufacture or direct practice of making simple biogas. Cow manure that is used is cow dung that comes from village farms which is as much as 3 kg. Cow dung used is cow dung that is still wet or still mixed with urine. Cow dung is then mixed with water with a ratio of 1:1, so that 3 Kg cow dung is mixed with 3 liters of water. After that, the two ingredients are stirred until smooth before finally being put into the biodigester. Biodigester is then tightly closed and stored in a cool, low-light room. Fermentation time of about 1 - 2 weeks new gas can be produced. Besides being able to produce biogas fermented cow manure can also produce solid and liquid compost as a by-product. The benefits obtained are not only one but can also be beneficial in the field of agriculture, especially in accordance with one of the village programs, namely livestock-based agriculture. If 3 cows have been able to produce enough biogas for cooking and power generation, village farms that have 9 adult cows and 1 calf will not rule out the village cow dung can be one source of energy for residents and the byproducts are solid compost and liquid can be distributed to surrounding farmers. Based on the results of checking after the waiting period both of them experience imperfections due to the leakage of the composter and digester devices so that the fermentation and composting process takes place imperfectly so that further testing cannot be carried out.

4. Conclusions

Based on the activities that have been carried out both in making biological fertilizers and biogas conclusions can be drawn as follows:
1. The resulting product is not perfect, this is due to tool leakage and limited storage time. Whereas in the biogas on the 6th day a small amount of gas is formed but afterwards it decreases or the gas is not formed again.
2. Ladies of Family Welfare Empowerment are enthusiastic in making biological fertilizers.
3. Biogas that has been produced has not yet been tested on a flame. Biogas formed has a by-product in the form of solid and liquid fertilizer.

Therefore, then:
1. There needs to be guidance from the government related to the utilization of organic waste both in making biogas and biological fertilizers.
2. It is necessary to have a correlation that can facilitate the making of complex digester around the farm as a village cow manure fermentation tool so that it can be fully utilized.
3. Training and coaching still need to be done in the village community both for Ladies of Family Welfare Empowerment and youth groups.

5. Acknowledgments

The author expresses his deepest gratitude to the University of Bangka Belitung for funding this activity through the Real Work Lecture program, which one of the outputs is this paper. Furthermore, the authors would like to thank the parties who helped so that this paper was presented at the National Symposium on Community Service 2018 held by HSBC Indonesia in collaboration with Sampoerna University supported by Indonesian Journal Volunteers.
6. References

[1] A Ayub, A. Haryanto, S. Prabawa. 2015. Produksi Biogas dari Rumput Gajah (Pennisetum Purpureum) Melalui Proses Fermentasi Kering. Artikel Ilmiah Teknik Pertanian Lampung: 33-38.

[2] Asngad, A., Astuti, P., dan Rahmawati, I.N. 2013. Pemanfaatan Limbah Air Cucian Beras IR-36 dan IR-64 (Air Leri) Untuk Pembuatan Sirup Melalui Fermentasi Dengan Penambahan Bunga Rosella Sebagai Pewarna Alami. *J. Agrocultural. FKIP UNS* 10(1).

[3] Deublein, D., and A. Steinhauser. 2008. Biogas from Waste and Renewable Resource. Wiley-VCH Verlag GmbH & Co. KgaA. Weinheim. 443 hlm.

[4] Istriomah, N. 2012. Pengaruh Pemberian Air Cucian Beras Coklat terhadap Pertumbuhan dan Hasil Tanaman Seledri (*Apium graveolens* L.) pada Tanah Rawa Lebak. *Agrocientia*. 3(17): 152-155.

[5] Nurdiyanti D, Utami A.S, Bastian N, Johan J. 2017. Pemanfaatan Limbah Organik Pasar Sebagai Bahan Pupuk Kompos Untuk Penghijauan Di Lingkungan Masyarakat Kota Cirebon. *The 5th Urecol proceeding. UAD Yogyakarta*.

[6] Purnami, WG. Yuswanti dan Astiningsih. 2014. Pengaruh Jenis dan Frekuensi Penyemperotan Leri terhadap Pertumbuhan Bibit Anggrek (*Phalaenopsis* sp) Pasca Aklimatisasi. *Agroekoteknologi Tropika*, 3(1) : 22-31.

[7] Retno S. 2009. Kajian pemanfaatan pupuk organik cair mikroorganisme lokal (MOL) dalam priming, umur bibit dan peningkatan daya hasil tanaman padi (*Oryza sativa* L.) (Uji coba penerapan *system of rice intensification* (SRI)). *Tesis*. Universitas Sebelas Maret Surakarta.

[8] Sulistyanto Y, Sustiyah S, Zubaidah S dan Satata B. 2016. Pemanfaatan kotoran sapi sebagai sumber biogas rumah tangga di kabupaten pulang pisau provinsi Kalimantan tengah. J. udayan mengabdi 15(2):153-158.

[9] Wahyuni, S. 2011. Menghasilkan Biogas dari Aneka Limbah. Edisi Pertama. PT Agro Media Pustaka : Jakarta. Hlm. 96.

[10] Wibowo, T.S., A, Dharma, dan Refilda. 2013. FermentasiAnaerob dariCampuran Kotoran Ayam dan Kotoran Sapi dalam Proses Pembuatan Biogas. Jurnal Kimia Unand. 2 (1): 113-118.

[11] Zakaria. 2013. Pemanfaatan Kulit Telur dan Air Cucian Beras dengan Penambahan CMA pada Media Tanaman untuk Pertumbuhan Tanaman Tomat (*Solanum lincopersicum*). *Skripsi*. Fakultas Keguruan dan Ilmu Pendidikan Universitas Muhammadiyah Surakarta.