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Livestock waste management to improve community knowledge in the cow farming groups

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ABSTRACT

The Wong Cilik Animal Husbandry Group is still struggling with traditional waste treatment, which pollutes the air and soil. The goal of indoctrination is to educate and encourage livestock farmer groups to be proactive in controlling, overcoming, and making decisions regarding cow manure waste. Furthermore, this activity aims to strengthen the Wong Cilik Farm Community Group's capacity to use cow manure through teaching and encouragement. Several experts from the fields of machinery, agriculture, and psychology participated in this activity. Participants were given a pre-test and a post-test before and after socialization. The results of the pre-test and post-test indicated that the activity's objectives of increasing the community's knowledge about livestock waste management were met. The community is finally aware that livestock manure can be used to convert the residual biogas waste into manure. Through this socialization, the community learns that cow manure waste can be turned into products with high value.

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1. INTRODUCTION

The cattle industry is one of the economic pillars of the Indonesian people. Due to the availability of food sources and the relatively high cost of beef, this item is essential. Cattle create sewage, which can contribute to air and soil pollution and meat. Cow manure includes methane gas, a source of GHG (greenhouse gas) emissions that contributes to global warming via the "greenhouse effect" (Adeniran et al., 2014; Ramaiyulis et al., 2021). It is believed that cattle can produce between 250 and 500 liters of methane every day (Astiti & Bulu, 2016).

Livestock waste, especially from cattle rearing, has much potential. One effort that can be made to utilize this waste is to process it into biogas and manure. Irmayani et al. (2017) state that biogas brings health, social, environmental, and financial benefits. Biogas installations are helpful for decentralized

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energy sources that produce gas, electricity, and fertilizer (Haryanto et al., 2017). So, breeders can get two advantages from processing cow manure: energy and fertilizer. Processing feces into biogas produces a byproduct in the form of sludge, which has the potential to be used as animal or fish feed and as organic fertilizer (Junus, 2015; Shaibur et al., 2021).

Cows can produce up to 12% of their body weight in manure containing NH3, NH, and other compounds. Waste that comes from cattle farms but is not treated can pollute the environment in the air and soil. Even though cow dung is not only in solid waste, the urine and livestock sanitation wastewater produced still contain nutrients that can be used as manure (Sukamta et al., 2017). Livestock manure is rich in nitrogen and metal minerals such as magnesium, potassium, and calcium, which maintain the soil's physical structure so that plant roots can grow properly (Hafizah & Mukarramah, 2017). Cattle can produce 20–30 kg of solid waste and 100–150 liters of liquid waste for each cow (Saputro et al., 2014). Furthermore, Astiti & Bulu (2016) state that a cow can produce 4-6 tons of solid manure per year, or around 11–16 kg per day, so community group disposal of cow manure can have a negative impact on the environment and health. In addition to environmental pollution, cow dung that is not appropriately managed can indirectly cause flies to attack cows, resulting in cows getting diarrhea (Zuroida & Azizah, 2018). Wong Cilik Farm is located in Umbansari Village, Rumbai, Pekanbaru, Riau. Cow dung produced on this farm is still not handled properly. The Wong Cilik Farm farmer group is a community consisting of both breeders and vegetable farmers simultaneously. This group utilizes solid cow manure by processing it into wet manure, which still smells and is packaged in plastic sacks.

Figure 1. Appearance of the cage's condition
Figure 2. The blue arrows represent heaped cow manure

Conventional processing of cow dung waste is still a problem in the Wong Cilik Farm breeder group, so fertilizer production needs to improve, as seen in Figure 2 above. The cow dung waste is still wet, and the nutrients are still of low quality, so it can only be sold for IDR 5,000 to IDR 8,000 per sack. The cattle breeder group's business activities could expand into other fields, such as household gas and organic fertilizer. However, the Wong Cilik Farm cattle breeder group needs encouragement and education to deal with the problem of cow dung waste. The business actors in the farmer group at Wong Cilik Farm place more emphasis on the results of raising cattle, while the cow dung produced is not an important part.

Managing resources such as cattle waste in the form of manure and urine from cows is one sign that can assist in enhancing a community's economy. The goal of the breeders' group has yet to be to make things out of things that already exist, like making available solid and liquid cow manure. According to the theory of achievement goals, exploring the focus object tends to approach several

other actions (Grajcevci & Shala, 2021; Maehr & Zusho, 2009). However, in this instance, the livestock group tends to suppress other achievement goals and only focus on the dominant object.

Achievement goals are self-commitments that guide individuals when perceiving and viewing situations that occur through their competencies (Sommet et al., 2016). The achievement goals themselves consist of four main focuses, namely: (1) Mastery approach, namely mastering the task and continuously increasing its value; (2) Performance approach, namely trying to outperform others; (3) Mastery-sensing, namely mastering the task well and increasing; (4) Finally avoidance of performance, namely not being able to be surpassed by others. Each individual in pursuit of goals has different ways and behaviors. However, individuals who can utilize resources provide more accessible performance and success (Harackiewicz & Sansone, 1991; Wang et al., 2017).

Socialization of achievement goals is a cognitive representation that focuses on the future, directs behavior in a more advanced direction, utilizes self-competence, and is committed to achieving goals (Hulleman et al., 2010). More than efforts to increase the achievement of goals are needed, and there also needs to be psychological efforts to help increase them. Socialization activities are one way to help people get better by talking to them about how important it is to have goals to reach, especially when dealing with cow manure waste. Based on previous research, Wang et al. (2017) reported that achievement goals contribute to completing complex tasks and consistently maintaining high standards. Handling cow manure by processing it to produce gas and organic fertilizer is one way to reduce air and soil pollution, and better handling can reduce household gas expenses.

Preventive socialization is an educational strategy based on various findings that offer information necessary for implementing an action or intervention (Srivastava & Panday, 2016). Educating biogas installations through counseling and outreach increases awareness, proactivity, and performance concerning fulfilling duties or prepares persons to manage, overcome, and make decisions (Srivastava & Panday, 2016; Yadav & Kar, 2014). One of the extension practice actions carried out in the community is the socialization of livestock waste management among the Wong Cilik Farm cattle breeder group by integrating information regarding the potential to increase the availability of resources so that they have a higher resale value. One of the techniques involves taking action through psychoeducation and introducing livestock groups to cow manure-based biogas systems. This is also an excellent way to spread information meant to change how people act (Lukens & McFarlane, 2004).

Outreach, socialization, treatment, and education that are part of a community group have been shown to change how people are motivated and how well they reach their goals (Önemli & Yondem, 2012). It was also noticed that the motivational methods of those who had received counseling improved, which shows that the information given positively affected changes in goal orientation, goal focus, and self-assessment of the need to learn. According to Pedditzi (2014), achieving goals can influence self-esteem, perspective on success and failure, perseverance, and the ability to manage positive and negative emotions when confronted with difficult circumstances.

Community service activities provide a solution by providing a series of activities, including counseling and training so that the community obtains information and can operate a biogas facility for processing calf manure. Therefore, this community service (PKM) activity has multiple goals, namely: (1) Educating the farming community group at Wong Cilik Farm on the importance of achieving goals so that they are encouraged to improve their skills; (2) Educating on cow manure management through biogas processing; and (3) Educating on cattle waste management with installations.

2. METHODS

This community service refers to the difficulties encountered by the Wong Cilik Farm breeding group in Umbansari Village, Rumbai, Pekanbaru, Riau. This farmer group uses the PKM approach of counseling through education, socialization, and training in cattle waste management to control cattle waste. This activity involves groups of breeders and members of the surrounding community. A total of 17 individuals participated in a series of activities, including: (1) Counseling regarding the objectives of achieving so that the community was encouraged to improve their quality and capacity to develop a business through handling cattle waste; (2) Socialization of biodigester installations to produce gas from the processing of cattle waste; and (3) Providing training on cow dung waste processing so that it can produce biogas that can be used for household aerosolization.

The implementation stage of this community service activity is carried out in several locations, as seen in Figure 3 below. After an introduction and explanation of the intent and purpose of this community service activity, the team divided the implementation stage into three stages, namely, the first stage, in which installation and socialization were carried out. In this section, partners are given education related to what is meant by a biogas installation that can produce biogas, which is explained with installation drawings and waste handling simulations. Treating cow manure using a biogas installation can create biogas and drier manure that can be packaged.

In the second phase, participants listened to lectures and participated in question-and-answer sessions regarding their educational and professional objectives. In the first session at this stage, participants were given a questionnaire to assess their level of self-awareness and their skills. Before and after the counseling session, questionnaires were issued to measure the participants' knowledge and comprehension of the session's objectives.

In the third phase, participants were instructed to operate a biodigester to convert cow dung waste into biogas. The biodigester installation was initially created and tailored to site circumstances in preparation for a succession of installations. The biodigester installation includes important components such as a 2000-liter tank as a reactor for the settling of cow dung waste, an inlet for the manure to enter the reactor tank, a reservoir for the remaining manure, and a gas storage tank in the shape of a balloon with a pipe to channel gas to the shelter. Raw materials are one of the most crucial aspects of processing cow dung using a biodigester system. Long-established raw materials have fewer gaseous components. Thus, fresh manure and cow pee are required.

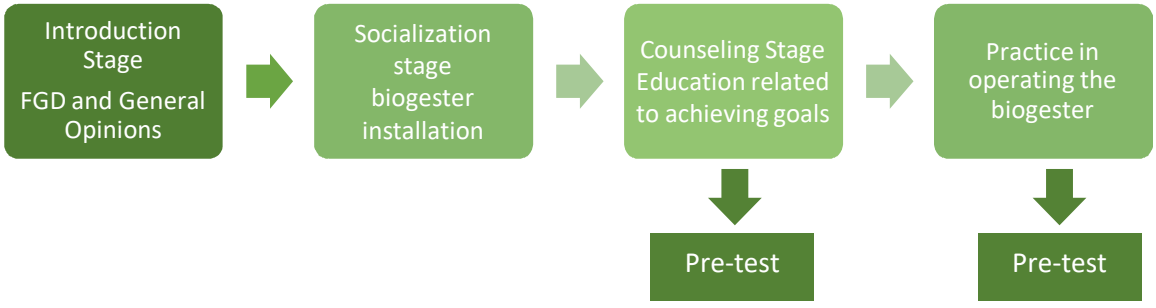

Figure 3. Process flow illustration of community service activities Psychoeducation and socialization of livestock manure management

The stages of implementing community service activities for dealing with livestock waste are depicted in Figure 3. During this phase of the activity, outcomes and follow-up are anticipated. In addition,

Figure 3 explains that the pre and post-tests were conducted by collecting data through a questionnaire. The achievement goal statement scale consists of 12 questions divided into four assessment aspects: performance approach, performance avoidance, mastery approach, and mastery avoidance. Strongly Agree (SA = 4), Agree (A = 3), Disagree (D = 2), and Strongly Disagree (SD = 1) are the scale's Likert statement response scale categories.

3. RESULTS AND DISCUSSION

Results

Firstly, community service activities were conducted through surveys and FGDs to establish a shared perception between the community service team and its partners. Counseling might take place at the residence of the head of partner Wong Cilik Farm, where activities will be conducted. The initial step is to introduce cow manure handlers to the biodigester installation. The group of cattle breeders at Wong Cilik Farm, located in Umbansari Village, Rumbai, Pekanbaru, Riau, underwent this activity, followed by the second phase, which consisted of goal-related counseling. Members of the breeding group, the head of the RT, and several residents attended this session's activity. Community groups of cattle breeders are educated through socialization and counseling by offering information on the definition and series of biodigester installation components.

According to Darmanto (2013), some community services in the country have produced waste treatment installation technology for cattle manure that processes livestock waste using a stirrer component with stirrers attached to the cylinder so that it may process and treat cow manure into fertilizer. Superior quality, In addition, Suharto (2013) described a cattle manure pellet machine with extrusion technology that helps breeders and farmers indirectly enhance their family's economic situation. Figure 4 depicts the livestock waste processing design and installation discussed throughout this community service project.

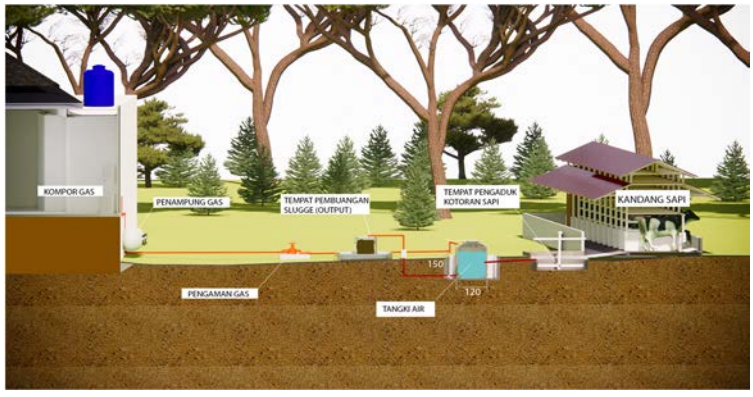

Figure 4. The construction of a biogas machine to treat livestock waste

The flow and steps of the biodigester or digester installation, as shown in Figure 4, illustrate how the main building of the biodigester accommodates methane gas. This gas is considerably cleaner than coal when it is burned. Therefore, it provides a great deal of energy with fewer carbon emissions. The biogas reactor in this community service project comprises a mixing tank as a reservoir for cow manure, a gas transit system, and a separator hole between manure that has lost its gas content and manure that still contains gas. The reactor tank's location, or the construction site selection, is also crucial. The

construction site selection significantly impacts the quality of the gas produced. The stability and flatness of the reactor's surface affect the processing of sewage into gas, as does the proximity of the processing site to the cow pens so that it is not difficult to load raw materials into the reactor.

The type of biodigester shown to the Wong Cilik Farm Farmers was a batch digester. Since raw materials are always available, it only needs cow manure, which is collected over a long period and turned into biogas. In Figure 4, the biodigester system is constructed next to the barn, where cow manure from the stall may be pumped into the mixing tank and then into the biodigester. With a pipeline, the produced gas is directed to a gas storage facility called a reactor for further usage. In the subsequent cycle, the material processed for a given period becomes the residual of the dryer sewage process and exits through the reactor pipe to be used as organic fertilizer later.

After socializing the handling of cattle excrement with a biodigester, the next session consisted of counseling. Breeder groups and the surrounding community can be motivated to enhance their talents and passion for livestock waste processing if they are educated about the aims of achievement. Psychological aspects such as negative emotions cannot be separated from the individual due to feelings of failure apprehension; hence, individuals prefer to avoid taking advantage of possibilities in their social context (Farradinna & Fikri, 2020). According to Uztemur (2020), individuals with goal-performance orientation and mastery-goal orientation fall into two categories: approach and avoidance.

Individuals whose objectives are based on mastery can fulfill the tasks at hand while maximizing their insights and abilities. One option is to utilize a biogas facility to convert livestock manure into biogas that can be used in residences. Meanwhile, those whose goal is to avoid mastery exhibit avoidance behavior in uncertain situations and may fail to achieve their goals (Kirbulut & Uzuntiryaki-Kondakci, 2019; Uztemur, 2020). Figures 5 and 6 depict socialization and extension initiatives for handling cattle manure.

Figure 5. Socialization of the biogas installation used to convert animal waste to biogas
Figure 6. Counseling concerning educational objective attainment

Before socialization and therapy, participants must complete a questionnaire regarding their achievement objectives. The objective is to compare achievement goals before and after receiving socialization and counseling services. Table 1 shows additional explanations about before and after socialization and counseling services.

According to the statistical analysis shown in Table 1, there are differences in achievement targets before and after socialization and counseling. This is demonstrated by t = -6,488 (df = 16) and < 0.05. Before receiving treatment, the mean was M = 44.5, but after receiving treatment, the mean increased to M = 49.92. Based on the analysis results, it was determined that the participants in the counseling to attain the goals exhibited a more advantageous pattern of learning behavior. According to a study

by Uztemur (2020), individuals with a learning process approach show better intrinsic motivation; the intention to improve their abilities comes from within themselves. The analysis showed a change in the increase in the achievement goals of the extension participants before being given treatment (attainment counseling). Therefore, counseling on achieving goals needs to be carried out for groups of breeders so that they not only gain knowledge from handling livestock waste but also be personally encouraged to develop their abilities in a better direction.

Table 1. Information regarding post-implementation success community service goals

Statement	Before Treatment	After Treatment
I try to do a job better than anyone else	49	56
I have a target to achieve better work results than others	46	51
I have the goal of achieving better work results than others	45	51
I have a goal of avoiding doing a poor job compared to others	50	55
I try to avoid doing a bad job compared to other people	41	50
I have a target to avoid doing a bad job compared to other people	39	43
I have a goal of mastering my work	53	57
I have the goal of learning everything about my job	47	50
I try to understand everything about my work	40	46
I have a goal of avoiding learning too much from my work	46	51
I aim to avoid learning little from my work	40	44
I try to avoid a lack of understanding about my work	38	45
	Mean = 44.5	**M = 49.92**

This community service project concludes with instructions on utilizing and operating a biodigester installation. In this session, groups of breeders who had previously received socialization were gathered at the site where the biodigester had been erected. Figures 7 and 8 depict the biodigester installation process before and after its completion and readiness for usage.

Figure 7. Illustrates the installation procedure for biogas processing using a biodigester installation
Figure 8. Biogester installation complete installed and tested

The two pictures show that the biodigester is installed close to the cage to ensure enough raw materials. The biodigester installation depicted in Figure 7 depicts the positioning of the reactor tank following excavation; placing the reactor tank on peatland is one of the most crucial considerations (Putra et al., 2019). To overcome the instability of the reactor tank's position in peat soil conditions,

several measures must be taken, including ensuring that the soil is not submerged in water, constructing planks to prevent the reactor tank from moving, and positioning the input position (where the dirt is inserted) so that it is not submerged in the soil.

During this stage of the activity, the farmer group was also introduced to all the essential components of the biodigester installation, beginning with the input section, the reactor tank, the disposal site for the remaining biogas, and the installation of pipes from the reactor tank to the gas reservoir and stove. The participants were required to practice the steps for working with biogas, including introducing raw materials, closing the input valve, and applying the biogas-powered stove. Based on this series of community service activities, it is evident that participants can increase their talents by utilizing biodigesters for domestic requirements. The results of the pre-test and post-test analyses support the optimistic view of the farmer groups that, by enhancing their capabilities, they will perform better, for example, by converting livestock manure into biogas that can be used not only for household consumption but also for broader applications. Additionally, farmer organizations not only sell cow manure as wet manure at a lesser price, but they can also create and sell odorless, drier, higher-quality manure if they are confident in their ability to generate it.

Discussion

Based on this set of community service projects, it is clear that participants can improve their skills by using biodigesters at home. The results of the pre-test and post-test analyses support the optimistic view of the farmer groups that, by enhancing their capabilities, they will perform better, for example, by converting livestock manure into biogas that can be used not only for household consumption but also for broader applications. Additionally, farmer organizations not only sell cow manure as wet manure at a lesser price, but they can also create and sell odorless, drier, higher-quality manure if they are confident in their ability to generate it.

The Wong Cilik Farm breeding group needs a biogas installation that can aid in resolving the problem of animal waste that annoys nearby neighbors and motivation to pursue better objectives. One of the primary goals of this extension effort was to urge farmer groups to increase the selling price of cow manure processed into organic fertilizer, which has a higher selling price than conventional manure processing. There are currently available resources and market shares for biogas and organic fertilizers; nevertheless, due to the low achievement of goals by each group of breeders, it is required to provide counseling and training to develop individuals. Following the findings of a study provided by Pedditzi (2014), achievement goals are shaped by self-esteem, viewpoints on success-failure, tenacity, and positive and negative environmental responses.

By filling the digester tube with the anaerobic substrate (animal dung) for a predetermined amount of time, biogas with biodigester technology is a simple, appropriate technology. The resulting gas is then used as a source of energy. Biogas technology facilitates establishing a livestock manure recycling system that generates biogas and organic fertilizer byproducts. Using biodigester can limit the emission of methane gas (CH4) created by the decomposition of organic waste, which is then produced from cow manure that does not disintegrate publicly but is fermented into biogas. These techniques and work activities prevent cow feces from polluting the environment and limit the impact of disease on cattle and the surrounding ecosystem.

One of the companies closely associated with attempts to meet food needs is the cattle industry's utilization of manure. The correct processing system is required to process manure from livestock in a manner that is both efficient and yields higher-quality manure. Based on the analysis of the conducted

tests, it has also been determined that counseling causes a paradigm shift and increases the motivation of farmer groups to develop their skills. Therefore, continual counseling for the accomplishment of objectives is possible. Farmer groups requiring assistance in managing a biodigester installation to treat manure from livestock are required to receive better outcomes.

4. CONCLUSION AND RECOMMENDATIONS

Based on the objective of the PKM activity, namely to determine the extent to which the offered information and knowledge can be correctly assimilated through psychoeducation and socialization of handling cow waste in the Wong Cilik Farm cattle breeder group, a study was conducted. This PKM activity consists of counseling and socialization techniques relating to establishing biogas systems, which can create gas that inhabitants can use to suit their needs. In addition to producing biogas, livestock manure is processed into organic fertilizer to suit the needs of agricultural land, which is the primary source of income for the surrounding community. Implementing this community service activity also gives knowledge and encouragement to farmer groups to enhance the quality of marketing outcomes for biogas-produced organic fertilizers. The purpose of the counseling titled "Achieving Goals" is to inspire the community to package better and market the outcomes of animal waste processing. One of the individual challenges in this community is a need for more drive to improve one's ability and self-confidence in producing higher-quality items. Through indirect advice, the family's finances can be enhanced.

Counseling and dissemination actions for managing cattle manure in the Wong Cilik Farm breeding group are inextricably linked to several constraints and hurdles. The limitation during this activity is establishing the optimal time to participate, as participants' schedules cannot generally be established in advance. In addition, the state of the peat soil is highly wet; in fact, the volume of water can grow each time excavation is performed to locate the reactor tank. This allows excavation work and tank placement to be performed as rapidly as feasible and concurrently with the excavation. Due to the peat soil's high water content, acidic character, and abundance of huge stumps, the PKM team was forced to decide to dig deeper in order to remove the stumps from the earth. This exercise was often postponed and rescheduled due to the participants' hectic schedules, which constituted a barrier. However, partners have offered a time and location for counseling, allowing activities to operate smoothly and participants to gain a variety of information and expertise regarding the value of cow manure. Due to the peat soil's high water content, acidic character, and abundance of huge stumps, the PKM team was forced to decide to dig deeper in order to remove the stumps from the earth. This exercise was often postponed and rescheduled due to the participants' hectic schedules, which constituted a barrier. However, partners have offered a time and location for counseling, allowing activities to operate smoothly and participants to gain a variety of information and expertise regarding the value of cow manure.

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