

Analysis Of Changes In Farmer's Behavior: An Investigations Utilization Of Livestock Waste

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Abstract:

This study aims to determine changes in the behavior of farmers after being facilitated by the agency in the form of facilities and infrastructure for the use of livestock waste. The research was conducted in Jabung Subdistrict, Malang Regency, East Java Province. This study uses a qualitative approach where the determination of the informants is through purposive sampling technique. The sample that has been deliberately set as key informants consists of 3 farmers who come from group administrators and 25 farmers as group members who carry out routine livestock waste management. Next conducted in-depth interviews with informants using question guides and recording facilities to obtain valid and measurable information. Qualitative data analysis uses descriptive analysis which consists of three important components, namely: data reduction, data presentation, and drawing technical conclusions from data analysis. The results showed that there was a positive change in the behavior of farmers after being facilitated by the agency in the form of facilities and infrastructure of the livestock waste utilization. The conclusion from the research on mindset and behavior change, extension and intervention initiated by cooperatives with Hivos through the installation of livestock waste utilization facilities resulted in behavioral changes in farmers. This change in farmer behavior arises after experiencing various positive impacts from the use of livestock manure. This study recommends that it is important for policy makers to be able to provide a market for the marketing of processed products of animal manure to motivate farmers. Besides, it is necessary to carry out further training and assistance in order to increase the ability and capacity of farmers in processing livestock manure.

Keywords: Biogas, Behavior Change, Extension, Qualitative

Introduction

The development of the livestock sector is currently directed not only related to food fulfillment, but also related to health and the environment. Intensification of livestock business has achieved production efficiency but also needs to pay attention to environmental issues, which become a concern in both developed and developing countries. The impact of this sector on environmental pollution (ammonia, greenhouse gases and pathogens), evaluating the associated health risks and assessing the potential role of sewage treatment systems in the attenuation of environmental and health issues (Kasworo and Izzati, 2013).

One of the issues facing the cattle industry in terms of the environment is waste generation. Livestock manure is a sort of waste produced by livestock. This waste contributes to pollution, as livestock manure frequently causes environmental concerns that impair the quality of life for those who live near the farm. The stench is created by gases, particularly ammonia gas (NH₃) and hydrogen sulfide gas (H₂S). Both of these gases are a hazard to cattle and breeders at certain doses. Animals that inhale the two gases develop respiratory tract problems, making them more susceptible to sickness. How many studies have been conducted to determine the extent of environmental contamination and the detrimental impact of livestock waste on human health? (Mawdsley et al., 2009; Topp et al., 2009; Hu et al., 2017; Sampat et al., 2021).

Cow manure is one of the potential material to make organic fertilizer (Budiyanto, 2011). The need for organic fertilizers will increase along with the demand for organic products. According to Huda and Wikanta (2016), this is because organic products taste better, healthier, and good for the environment, besides that the world market share of organic products in the next 10 years will reach around US\$ 100 billion. Furthermore, in the United States, in 1997, the market share of organic products was about US\$3.5 billion per year and in 2000 it had approximately doubled.

According to Flotats, Bonmati, Fernandez and Magri (2009), the treatment of livestock manure has become an issue of concern in many farms, the success of this processing is highly dependent on the involvement of farmers, technology and fertilizer prices. Furthermore, Flotats, et al (2009) stated that intensive livestock production will contribute to the level of environmental pollution, including disposal to soil and surface water and emissions to the atmosphere. Conditions in areas with dense livestock populations require ammonia reduction technology and manure treatment processes that produce competitive products to replace the use of chemical fertilizers and (partly) improve nutrient cycles again.

According to Steinfeld et al. (2016), the environmental impact of the livestock industry can take the form of soil, water, and air pollution, which has the potential to harm the health of both cattle and people. In Indonesia, the cattle farming industry is still preoccupied with livestock productivity and has not considered environmental factors or the influence of actions on the environment (Mardotillah, 2021). According to Ningrum, Supriyadi, and Zulkarnain (2019), sustainable farming considers not only the survival and production of livestock, but also the disposal of waste that can harm the environment, particularly in places with large livestock populations. Many livestock enterprises fail as a result of poor environmental management, as waste is not effectively controlled (Hu, Cheng and Tao, 2017).

The behavioral aspect of farmers in Jabung Subdistrict, Malang Regency in managing residential trash is the first foundation in the management of residential garbage that can have a big impact. Positive conduct in the management of waste from the source facilitates the management of residential waste, which has an effect on the quality of the cleanliness of the residential environment and the enhancement of welfare in particular.

According to Barros, Salvador, and Piekarski (2020), the utilization of nutrient-enriched agricultural waste and the conversion of animal manure into organic fertilizer and biogas can raise livestock output, benefit breeders, and improve the environment. The study's focus is on farmers' waste management behaviors. Given that inadequate waste management practices might have negative implications, cattle ranchers' behavior has prevented waste products from being processed properly. This situation emerges as a result of farmers' lack of concern for adequate waste management. Environmental contamination frequently generates community conflict, especially if the farm is located near a settlement.

Cow dung can be used as organic fertilizer or as a biogas source. Organic fertilizers can improve soil texture, increase soil microorganisms, increase soil binding capacity to air, and assist maintain soil fertility. Thus, monitoring farmer behavior after the agency helped set up livestock waste utilization facilities in Jabung District is crucial. Malang Regency, Java.

Research Methods

This research was conducted in the Jabung District, East Malang Regency, which is the Jabung District, Malang Regency as one of the centers for dairy cattle which has a livestock population of 9,128. This study uses a qualitative descriptive research approach, which is a research method that utilizes qualitative data and is described descriptively. This type of qualitative descriptive research is often used to analyze social events, phenomena, or circumstances. The data is obtained from resource persons or information related to the place which includes the farming environment (land, gardens, livestock) and the livestock group environment. In addition, data is also obtained from archives and official documents. Data is obtained by collecting and reviewing documents, archives and books related to the behavior of farmers in the research location (Subdistrict strategic plan and archives from KUD).

This study uses a qualitative approach where the determination of the informants is through purposive sampling technique or in other words the selection of informants through choices based on the suitability of the characteristics possessed by the sample with the research objectives (determined the farmers who carry out livestock waste management on a regular basis). The sample that has been deliberately set as a key informant consists of 3 farmers who came from group

administrators and 25 farmers as group members who carry out routine livestock waste management. Furthermore, in-depth interviews with informants were carried out using question guides and recording facilities to obtain valid and measurable information. Qualitative data analysis uses descriptive analysis which consists of three important components, namely: data reduction, data presentation, and drawing conclusions. Technical data analysis adapted to the formulation of the problem in this study.

Results and Discussion

Result

Farmer's Perception of Livestock Waste Utilization Facilities

Behavioral change begins when someone hears something new for the first time and continues until the person adjusts his or her behavior in response to the new information. One technique to look for differences in behavior is to conduct interviews before and after the counseling/extension has been completed. According to the findings of interviews, farmers in the Jabung Subdistrict have changed drastically after the extension on how to utilize livestock waste was carried out. Extension professionals have a good track record of influencing farmer behavior. Farmers who were previously uninterested in managing their livestock manure can now do so effectively and even reap multiple benefits, such as social, technical, and economic implications, as a result of receiving intensive extension services.

Extension materials are not only about how to use livestock waste into organic fertilizer and alternative energy (biogas), but also as a medium for cultivating worms and maggots. Many farmers and people who are in contact with farmers, even people who do not own livestock feel the positive impact of the extension carried out. According to the explanation of the Head of KAN of Jabung Subdistrict, stated that:

"The efforts of livestock waste management have been carried out, one of them involves related agencies to conduct socialization and training for farmers to better utilize their livestock waste no longer as organic fertilizer and alternative energy but also as a medium for worms and maggots."

Another positive impact was also mentioned from the explanation of the Head of the development unit who stated that:

"For farmers biogas sludge has started to be used for planting media, and Alhamdulillah for fertilizers used for rice fields, they have started using organic fertilizers. If it usually comes from cow manure and buys organic fertilizer, now we can make our own compost. Yes, from yesterday's extension, sir. Added microbes so that the effect on plants is faster."

Then the Jabung Subdistrict KAN Manager also added that:

“Now little by little, after intensive extension has shown a change in their response to the presence of livestock manure, farmers have started to use their biogas sludge for plants that are always needed by households, such as chilies, tomatoes, leeks, lettuce and other plants planted around their homes. In addition, it is also used for worm and maggot cultivation media.”

Based on the three statements, it is clear that the presence of extension on livestock waste management, which is carried out intensively by involving agencies related to the utilization of livestock waste, has a positive impact, as evidenced by a change in response to the presence of livestock waste to be processed into alternative energy. The waste generated by management is converted into alternative energy in the form of biogas sludge, which is then reprocessed into organic fertilizer and used as additional nutrients for plants grown on their farms or for plants that are always needed by households, such as chili, tomatoes, leeks, lettuce, and other plants that can be planted using polybag media around the house.

These socialization and extension activities provide many benefits and significant changes for farmers. Because the problems that have been complained of, such as not being able to process livestock waste into organic fertilizer, are resolved when they are given the extension and socialization. From these extension activities, the farmers gained new knowledge, namely composting livestock waste with the addition of microbes so that the decomposition time of organic matter was shorter. Thus, the nutrients needed by plants are more available. In addition to the livestock waste management into alternative energy and the making of organic fertilizers, in the extension, new knowledge was also obtained, namely the use of livestock waste as a medium for cultivating worms and maggots.

The socialization and extension activities that have been carried out have not only provided benefits for farmers in utilizing their waste into more useful things, but also for residents in the Jabung Subdistrict area. One of the farmers in Jabung Subdistrict said that :

"It seems that we have started to realize the benefits of slurry mud, it is no longer just wasted but brings tremendous benefits."

Then, another farmer also added that

"There are already some residents who don't have cows who use biogas sludge for fertilization."

Based on this narrative, it can be said that the benefits of socialization and extension that have been carried out have had a very positive impact and provided many benefits. This also makes farmers aware of the extraordinary benefits of livestock waste, especially slurry which can be reused as the basic material for making organic fertilizers. Thus, no more livestock waste is thrown away in

vain and will indirectly reduce the impact of environmental pollution, especially river water and settlements close to the cages around the Jabung Subdistrict during the rainy season. The benefits of socialization and counseling are not only felt by farmers, but also by several other residents who are not farmers who also take part in utilizing biogas waste in the form of slurry to be reprocessed into organic fertilizer and used to fertilize planted plants so that their growth is optimum and achieves the desired results.

The socialization and extension activities carried out, in addition to increasing knowledge and understanding of farmers and local residents about the importance of livestock waste management, also add value to farmers, especially economic value. This was stated by the Head of KAN of Jabung Subdistrict who stated that :

"From several activities, of course, bringing added value to farmers, firstly, farmers don't buy LPG anymore for cooking, farmers don't buy organic fertilizers for their plants and worm production (*lubrecusbacillus*) has a high selling value of 25.000/kg live, for the production of maggot, it can also be sold or used alone as chicken feed or fish feed which contains high protein."

Based on the results of these interviews, it can be seen that socialization and extension activities not only increase knowledge, but also add value to farmers. With these socialization and extension activities, the management of livestock waste into biogas alternative energy becomes optimum. Farmers no longer need to buy LPG for cooking. They can use biogas from their livestock waste management to replace LPG as fuel. Thus, the money that should be used to buy LPG can be saved or diverted for other things such as additional business capital or so on. In addition, farmers are also taught to recycle waste from biogas production. The biogas waste in the form of mud is used to make organic fertilizer. The organic fertilizers that have been made can be applied to agricultural land or to the vegetable crops they grow around their yard. The production of organic fertilizer from biogas sludge also reduces the expenditure of farmers to buy organic fertilizer which they usually buy to be applied to their crops. In the extension, the farmers were also taught to cultivate worms (*lubrecus bacillus*) and maggots.

Biogas waste commonly known as slurry can also be used for the cultivation of worms (*Lubrecus bacillus*). From the cultivation of these worms, farmers can also get additional income from the sale of these worms. The selling value of live worms (*lubrecus bacillus*) is quite high, namely Rp. 25,000, -/kg. While maggots are the larvae of the Black Soldier Fly. Usually maggot is used for waste management or to help the decomposition process of organic materials. Maggots breed very quickly. For the cultivation of maggot, farmers can sell it or use it alone as chicken feed or fish feed that they raise because the maggots contains high protein. So that the use of maggot can reduce the use of feed and increase income for farmers in the Jabung Subdistrict. Perceptions related to changes in

farmers behavior after being facilitated by agencies in the form of livestock waste utilization facilities are shown in Table 1.

Table 1. Perceptions Related to Changes in Farmers Behavior After Being Facilitated by Agencies in the Form of Livestock Waste Utilization Facilities

Item	Answer	Frequency	Percent (%)	Average
Education to understand the benefits of waste	4	15	37.5	4.63
	5	25	62.5	
Managing waste brings additional income	4	17	42.5	4.58
	5	23	57.5	
Disagree that the extra income managing waste is nothing compared to the time we spend	1	8	20	1.83
	2	31	77.5	
	3	1	2.5	
The waste that we process into fertilizer can reduce environmental pollution	4	18	45	4.55
	5	22	55	
Stakeholder involvement is very helpful for waste management efforts	4	17	42.5	4.58
	5	23	57.5	
Kanjabung asset management in assisting waste management	3	3	7.5	3.95
	4	36	90	
	5	1	2.5	
Sometimes farmers don't have time to manage waste	1	8	20	1.83
	2	31	77.5	
	3	1	2.5	
Socialization and counseling must continue so that we do not lose motivation in processing waste	2	1	2.5	3.95
	3	2	5	
	4	35	87.5	
	5	2	5	
Processing waste is not only done by men but also women	4	14	35	4.65
	5	26	65	
Perceive that local administrators and extension workers are very responsive if	3	3	7.5	3.95
	4	36	90	
	5	1	2.5	

there are farmers who will consult about waste				
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Based on Table 1, the majority of respondents perceived that they strongly agreed that the extension made them understand the benefits of waste as much as 62.50%, followed by 37.50% who answered agree; Overall, respondents' perception is good in perceiving the extension made them understand the benefits of waste with an average of 4.63. Furthermore, most respondents perceived strongly agree that managing waste is a part-time job that can bring in additional income as much as 57.50%, followed by 42.50% answering agree; Overall respondents' perceptions are good in perceiving that managing waste is a part-time job that can bring in additional income with an average of 4.58. Then most of the respondents as much as 77.50% perceived disagree that the additional income from managing waste is not much compared to the time we spend, 20% perceived strongly disagree and the remaining 2.5% perceived neutral. Overall, respondents perceived well in providing a special time to operate biogas with a mean of 1.8.

Most respondents perceived strongly agree that the waste that we process to become fertilizer can reduce environmental pollution by 55%, followed by 45% who answered agree; Overall respondents' perceptions are good that the waste that we process to become fertilizer can reduce environmental pollution by mean of 4.55. Regarding stakeholder involvement greatly assists waste management efforts, most respondents perceived strongly agree that stakeholder involvement greatly assists waste management efforts equal to 57.50%, followed by 42.50% answered agree; Overall respondents' perceptions are good in perceiving stakeholder involvement greatly helps waste management efforts with an average of 4.55. The majority of respondents perceived that 90% agreed that the management of KAN Jabung was active in assisting waste management, followed by 7.5% answered neutral and the remaining 2.5% perceived strongly agree; Overall, respondents' perceptions are good in perceiving that the management of KAN Jabung was active in assisting waste management with an average of 3.95.

Related that sometimes farmers don't have time to manage waste, most respondents amounted to 77.50% perceived disagree that sometimes farmers do not have time to manage waste, 20% perceived strongly disagree and the remaining 2.5% perceived neutral. Overall, respondents perceived good that sometimes farmers don't have time to manage waste with a mean of 1.83. Meanwhile, the majority of respondents perceived that they agreed that socialization and extension must continue to be carried so that our motivation does not decrease in processing waste as much as 87.50%, followed by 5% who answered strongly agree and the rest perceived neutral and disagreed; overall respondents' perceptions are good in perceiving that socialization and extension must

continue to be carried out so that our motivation does not decrease in processing waste with an average of 3.95. Most respondents perceived strongly agree that processing waste is not only done by fathers but mothers can also do it amounted to 65%, followed by 35% answering agree; overall, respondents' perceptions are good in perceiving that processing waste is not only done by fathers, but mothers can also do it with the mean of 4.65. Furthermore, most of the respondents perceived that the local management and extension agents were very responsive if there were farmers who would consult about waste as much as 90%, followed by 7.5% answered neutral and the rest perceived strongly agree; overall respondents' perception is good in perceiving that local management and extension agents were very responsive if there were farmers who will consult about waste with an average of 3.95.

Discussion

After socialization and counseling related to waste management were carried out, many of the farmers changed their "mindset" and behavior. These changes in mindset and behavior include, among others, that they want to process their livestock waste into various products, such as conducting waste management using a bio-digester and organic fertilizer. Besides that, the waste from biogas production from the biodigester in the form of bioslurry is also reused to make organic fertilizer as well as a medium for worm and maggot cultivation. All of these management activities aim to reduce environmental pollution, add functional and economic value to the farmers, so that could improve the welfare of the farmers' lives according to the vision and mission proclaimed by the government.

Many of the farmers have applied what has been given during the socialization and extension. This is in accordance with the main objective of extension activities, namely a change in behavior, especially in adopting an innovation (Guerin & Guerin, 1994; Sunding, D., & Zilberman, 2001; Leeuwis, 2013; Maree, 2020). Behavior change is a process that involves a clear process of understanding audiences in motivation and involves them directly in a series of communication media and concrete steps (Williams, 2012). In this case, the role of the extension agent is very important. Extension agents can influence decision-making behavior by developing various strategies that are in line with individual and group goals. The extension must be made as relevant as possible, so that it is more likely for behavior change to be in accordance with the purpose of the extension, which is to make farmers aware of being more concerned with the environment by not throwing waste into rivers and being able to process the waste into products that have added value. If farmers do not realize that they are 'part of the problem' then they will be indifferent to the information provided by extension workers about potential 'solutions' in solving the environmental pollution problem. This is in line with the statement of Poshtumus et al. (2008) which

states that farmers are reluctant to engage in problem-solving when they feel that they will not get benefit from the actions they will take. Usually, the main reason whether want or not farmers to follow directions from the extension worker depends on whether the perceived benefits are greater than the action that must be taken, after that, after that the way the extension worker delivered.

In addition to changing mindsets and behavior, socialization and extension activities have a positive impact on the social, knowledge or technical life and economic life of the farmers. The social impact felt by the farmers is the closer relationship that exists among the farmers due to several activities carried out together and mutual cooperation. Besides that, it is also known that communication in social systems or groups is considered an important process in articulating, sharing and exchanging ideas among farmers. These activities can strengthen the social interaction that occurs among groups of farmers in the Jabung sub-district. According to Huanrong (2001), interactions among the groups have several connotations, namely: (a) Inter-organizational relationships are basically social contract relationships, both formal and informal; (b) historical dependence, inter-organizational relationships associated with ongoing and future interactions; (c) The structure of inter-organizational relationships is multifaceted; (d) not only explicit forms (formal contracts), but also emotional, cultural, friendship, genetic, geographical forms; and (e) Inter-organizational relationships are a continuous process.

Conclusion

Based on the results of the study, it can be concluded that the extension and intervention initiated by the cooperative with Hivos through the installation of livestock waste utilization facilities resulted in behavioral changes in farmers. This change in farmer behavior arises after experiencing various positive impacts from the use of livestock manure. Besides being processed into organic fertilizer for additional nutrition for plants, livestock manure is also processed into biogas which is able to subsidize the use of LPG gas. Biogas production waste in the form of bio-slurry can also be used as a medium for worm and maggot livestock.

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