JPPIPA 10(5) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Cattle Waste Management Strategy for Environmental Health in Pucangarum Village, Baureno District, Bojonegoro Regency

Mohammad Sholikin[1]*, Jati Batoro[1], Wresty L. Anggayasti[1], Maharani Pertiwi[1]

[1]Postgraduate School, Brawijaya University, Malang City, Indonesia

Received: December 27, 2023
Revised: April 16, 2024
Accepted: May 25, 2024
Published: May 31, 2024

Corresponding Author:
Mohammad Sholikin
msholikin2023@gmail.com

DOI: 10.29303/jppipa.v10i5.6739

Abstract: Livestock farming is one of the economic supporting sectors in Pucangarum Village, Baureno District, Bojonegoro Regency, East Java. The number of cattle in this village has increased from year to year by 31.29%. To maintain the sustainability of this cattle business, new breakthroughs are needed to eliminate the negative impact on the environment caused by livestock waste. The aim of the research is to find a waste management strategy in Pucangarum Village that is able to maintain the carrying capacity and capacity of the environment. Quantitative methods were used in this research. The analysis used is SWOT and AHP analysis to find priority strategies for the above problems. The results of strategy analysis using SWOT and AHP analysis show that the most suitable strategy to use in Pucangarum Village is a combination of Strength and Opportunity (SO), namely by providing regular counseling and assistance to breeders, provide training on processing livestock waste (biogas, fertilizer, etc.), provide education regarding the potential for waste processing to generate money or save electricity (biogas) and the government provides assistance in creating communal biogas installations.

Keywords: AHP; Livestock; Livestock Waste; Strategy; SWOT.

Introduction

The majority of people in Pucangarum Village, Baureno District, Bojonegoro Regency, earn their living as farmers and farm laborers, with some farmers also raising livestock, especially cattles. The cattle population in Pucangarum Village experiences ups and downs every year, where in 2021 the cattle population reached 136 heads, in 2022 it reached 90 heads and in 2023 it increased to 131 heads (Pucangarum Village Profile, 2023). The livestock rearing carried out by the people of Pucangarum Village is generally carried out in the house or behind the house, where the condition of the cage is generally still one with the house where they live. According to Rasyid and Hartati (2007), livestock pens should not be part of a residence, at least the distance is approximately 10 meters, and should not be close to public buildings or too busy environments. The closer the house is to the farm, the more the impact will be felt, and it will also be influenced by the large number of livestock. Cattle manure in the Pucangarum Village environment is usually just piled up or thrown away in the yard near their house, so it has the potential to cause environmental pollution, water pollution and unpleasant odors, especially during the rainy season (Ambar, 2019). The results of observations in the August period regarding the management of beef cattle waste in Pucangarum Village were only processed as is, by collecting it and leaving it piled up in the open air without any further processing, relying solely on the natural decomposition process. Livestock waste is one of the important things that must be considered in dealing with, because it can have a negative impact on the environment and health if the waste accumulates or is landfilled in large quantities (Irsyad, et al., 2018).

How to Cite:
Sholikin, M., Batoro, J., Anggayasti, W. L., & Pertiwi, M. (2024). Cattle Waste Management Strategy for Environmental Health in Pucangarum Village, Baureno District, Bojonegoro Regency. *Jurnal Penelitian Pendidikan IPA*, *10*(5), 2727–2735. https://doi.org/10.29303/jppipa.v10i5.6739

Livestock waste is a critical point of sanitation that must be paid attention to by all inhabitants of the earth. Livestock waste such as cattle dung that is simply piled up will cause odor pollution and if it rains it will contaminate the environment through ground water and surface water and become a source of disease (Ambar, 2019). Based on the results of observations during the period from July to August, the use and management of cattle waste in Pucangarum Village has not been carried out optimally even though livestock waste can produce added economic value. Public awareness of cattle waste and its use has not been developed, this is due to the limited knowledge and skills of the community in processing cattle waste as well as the lack of local community awareness about the importance of processing livestock waste in terms of health, environment and also the economic benefits that can be obtained (Triatmojo et al ., 2016). One way to avoid the emergence of health complaints due to cattle waste is to maintain the sanitary conditions of the cattle pen and waste. Sanitation is an activity that includes clean cages and a clean environment, because with a clean cage and environment, the health of the livestock and their owners will be guaranteed. The cleanliness of the cage can be regulated according to needs so that it does not create a smelly and damp environment (Rasyid and Hartati, 2007).

Livestock waste sanitation refers to efforts to maintain cleanliness and health in managing livestock waste. The main goal is to prevent environmental pollution, protect animal and human health, and promote sustainable livestock practices (Permatasari, 2017). Several methods that can be used to process livestock manure and make livestock farming sustainable with zero waste are by using the biogas produced, making it food for worms and turning manure waste into organic fertilizer (Bulkaini et al, 2017). The perception of the community in Pucangarum Village regarding environmental management regarding the sanitation of existing livestock waste is the main thing in awareness of environmental health. Perception is essentially the activity of sensing, integrating and providing judgment on physical objects and social objects, and this sensing depends on the physical stimulation and social stimulation in the environment. Sensations from the environment will be processed together with things that have been learned previously, whether in the form of hopes, values, attitudes, memories, etc. (Sunarto, 2006). This is the background for conducting research on "Evaluation and Management Strategy for People's Cattle Waste for Environmental Health (in Pucangarum Village, Baureno District, Bojonegoro Regency)".

Method

This research uses quantitative research methods. According to Creswell (2014), quantitative research methods are a type of research method that uses a scientific approach and uses numbers or statistics to explain and test the phenomenon being studied. In quantitative research methods, the data collected is in the form of numerical data, such as survey results, measurement results, or data from experiments. Quantitative research methods allow researchers to analyze data statistically and provide conclusions that are reasoned and objectively measurable (Creswell, 2014). The quantitative descriptive analysis that will be used in this research is in the form of an analysis of breeders' perceptions, followed by an analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) in analyzing strategic factors, strengths and weaknesses, with external factors in the form of opportunities.) and threats for preparing an evaluation and strategy for managing people's cattle waste for environmental health in Pucangarum Village. After the SWOT analysis, an AHP analysis is carried out to see the priorities of the strategies found. Data collection was carried out using a questionnaire that had been tested for validity and reliability.

Results and Discussion

Cattle Waste Management Strategy for Environmental Health in Pucangarum Village

The strengths, weaknesses, opportunities and threats found at the research location, especially regarding waste management in Pucang Arum village, include:

Identify Internal Factors
Strength (Strength)

There are five strengths identifed, namely: Farmers have knowledge about waste management; Motivation to participate in farmer training and counseling is still high; Processing livestock waste will have a positive impact on local communities in reducing air pollution; Processing livestock waste will have a positive impact on local communities in reducing sources of disease and Proper processing of livestock waste can reduce environmental pollution.

Providing education to breeders has proven successful in increasing breeders' knowledge, skills and attitudes towards zero waste-based cattle dung waste management from 60 percent to 100 percent (Saleh et al, 2023). Farmers at the research location have high motivation to develop their livestock business by participating in training and counseling (Purnamasari et al, 2020). There are several ways to manage livestock

waste, namely biological, chemical and physical management (Sunarsih, 2014). Physical management is usually carried out to separate solid particles in waste, while chemical processing uses processes such as flocculation, coagulation, extraction and spertine neutralization (Saidi, 2022). Animal waste management that is easy to do is by composting. Composting has several benefits, namely reducing waste accumulation, increasing the selling value of livestock manure and reducing air pollution due to burning waste (Soadikin et al, 2019). Apart from that, managing livestock waste can also reduce the risk of disease arising from the entry of liquid livestock waste into water sources used by humans. Pollution that occurs due to livestock waste occurs because livestock waste contains NH3 (Sultan et al, 2023).

Weakness

There are five weakness identifed, namely: Lack of knowledge about livestock waste management technology; The level of public will is still low in managing livestock waste; Limited capital for manufacturing products resulting from livestock waste management; Untreated livestock waste will cause unpleasant odors and be a source of disease and Limited land or space for managing livestock waste.

Livestock waste that is not managed properly can cause environmental and water pollution which will have an impact on human life (Sajuri et al, 2022). Management of livestock waste reduces the level of pollution so that people's livestock become more sustainable because they are environmentally friendly (Sari and Emawati, 2020). The large number of breeders who do not know about processing livestock waste occurs due to a lack of socialization from other parties, resulting in low knowledge and skills of breeders in dealing with livestock waste problems. Apart from that, limited time, space and energy are the reasons why farmers are reluctant to manage livestock manure. However, organic fertilizer can be used by breeders to improve soil quality on forage land. Organic fertilizer increases the number of microorganisms in the soil, reduces the number of pathogens, neutralizes soil pH, increases fertility and increases forage production (Suliartini et al, 2023). However, if no processing is carried out, the accumulated livestock manure will only cause a smell and if left for a long time can cause disease.

Identify External Factors

Opportunities

There are five opportunity identifed, namely: Processing livestock waste can produce organic fertilizer; Processing livestock waste can produce biogas; Processing livestock waste can produce renewable energy; Processing livestock waste can increase community income and Processing livestock waste can encourage the development of sustainable animal husbandry.

Internal Factor Analysis Strategy (IFAS) Matrix

Managing livestock waste is one of the efforts to maintain environmental sustainability. Some uses that can be made are turning livestock waste into organic fertilizer and biogas as renewable energy. Biogas utilizes methane gas and turns it into gas fuel for cooking or converting it into electricity. Utilizing livestock waste into biogas can financially help reduce household expenses and increase the economic value of slurry use. Biogas management with a volume of 6-8 m2 has been considered feasible in biogas management (Hidayah et al, 2022). Biogas technology can prevent environmental pollution by converting waste into alternative energy (Muhammad et al, 2017). The management implemented can influence the amount of biogas production through the feed provided. Feed made from concentrate and crude fiber makes a more significant contribution to biogas production compared to feed using commercial feed (Matos et al., 2017).

Threats

There are five threat identifed, namely: Untreated livestock waste will pollute the surrounding residential environment; Untreated livestock waste will pollute water and soil; Cattle dung waste disposal sites located close to homes will cause environmental pollution which has a negative impact on health; Lack of support and outreach from the government regarding livestock waste management and There is no cooperation between farmers and local farmers to process livestock waste.

Disposal of livestock waste that does not pay attention to the environment can result in reduced discomfort and health for the people living nearby. The smell emitted from cattle dung is certainly disturbing but on the other hand it helps the economy (Indri et al, 2015). Livestock waste that is thrown into open spaces will have an impact on soil and air pollution (Astuti et al, 2023).

IFAS and EFAS Matrix Analysis

From the existing internal and external factors, a questionnaire was distributed to determine the priority scale (SP) and rating of each factor.

Table 1. Calculation of internal factor weights

Factor	Priority Scale (SP)	Constant (K)	SP x K	Weight
		Internal Strategy		
Strength (Strength)				
S1	4.5	5	22.5	0.20
S2	4.88	5	24.4	0.21
S3	4.69	5	23.45	0.20
S4	4.50	5	22.50	0.20
S5	4.50	5	22.50	0.20
Factor Value			115.35	1.00
Weakness				
W1	4.5	5	22.5	0.22
W2	4.52	5	22.60	0.22
W3	4.22	5	21.10	0.20
W4	4.69	5	23.45	0.23
W5	2.69	5	13.45	0.13
Factor Value			103.10	1.00

Table 2. Internal Factor Analysis Strategy (IFAS) Matrix

Strength	Weight	Ratings	Score
Farmers have knowledge about waste management	0.20	3.34	0.65
Motivation to participate in farmer training and counseling is still high	0.21	4.81	1.02
Processing livestock waste will have a positive impact on local communities in reducing air pollution	0.20	4.43	0.90
Processing livestock waste will have a positive impact on local communities in reducing sources of disease	0.20	4.52	0.88
Proper processing of livestock waste can reduce environmental pollution.	0.20	4.69	0.91
Total	1.00		4.37
Weakness			
Lack of knowledge about livestock waste management technology	0.22	4.64	1.01
The level of public will is still low in managing livestock waste	0.22	3.57	0.78
Limited capital for manufacturing products resulting from livestock waste management	0.20	3.45	0.71
Untreated livestock waste will cause unpleasant odors and be a source of disease	0.23	3.55	0.81
Limited land or space for managing livestock waste.	0.13	3.43	0.45
Total	1		3.76
Total IFAS Score			4.37-3.76
			0.61

External Factor Analysis Strategy (EFAS) Matrix

The results of calculating the weight of external factors (opportunities and threats) are presented in Table 3.

Table 3. Calculation of external factor weights

Factor	Priority Scale (SP)	Constant (K)	SP x K	Weight
		Strategy External		
Opportunities				
O1	4.58	5	22.90	0.21
O2	3.55	5	17.75	0.17
O3	4.88	5	24.40	0.23
O4	3.56	5	17.80	0.17
O5	4.88	5	24.40	0.23
Factor Value			103.30	107.25
Threats				
T1	4.10	5	20.50	0.18
T2	4.69	5	23.45	0.21
T3	4.57	5	22.85	0.20
T4	4.98	5	24.90	0.22
T5	4.51	5	22.55	0.20
Factor Value			111.55	114.25

Table 4. External Factor Analysis Strategy(EFAS) Matrix

Opportunity	Weight	Ratings	Score
Processing livestock waste can produce organic fertilizer.	0.21	4.57	0.98
Processing livestock waste can produce biogas.	0.17	4.22	0.70
Processing livestock waste can produce renewable energy.	0.23	4.60	1.05
Processing livestock waste can increase community income.	0.17	4.88	0.81
Processing livestock waste can encourage the development of sustainable animal husbandry.	0.23	4.88	1.11
Total	1.00		4.64
Threat			
Untreated livestock waste will pollute the surrounding residential environment	0.18	4.22	0.76
Untreated livestock waste will pollute water and soil	0.21	4.35	0.89
Cattle dung waste disposal sites located close to homes will cause environmental pollution which has a negative impact on health	0.20	4.52	0.90
Lack of support and outreach from the government regarding livestock waste management	0.22	3.78	0.82
There is no cooperation between farmers and local farmers to process livestock waste.	0.20	2.55	0.50
Total	0.58		3.88
Total EFAS Score			

IFAS and EFAS quadrants

Based on the results of the EFAS and IFAS analysis, the values obtained fall into the following quadrants:

X = strengths + weaknesses

= 4,37 - 3,76 = 0,61

Y = opportunities + threats

= 4,64 - 3,88 = 0,76

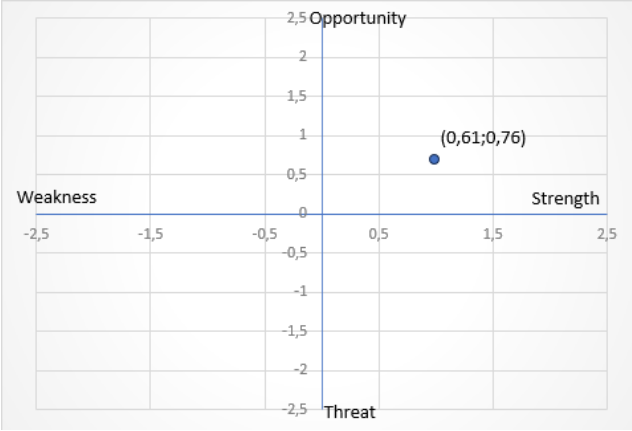

Figure 1. SWOT Quadrant

The X and Y positions are depicted in quadrant form at the point (0.61; 0.76) to form a diagram in Figure 1 which shows the SO strategy. SO strategy is as follows:

Provide training on processing livestock waste (biogas, fertilizer, etc.). The most important factor influencing the adoption of compost technology is knowledge. Farmers' knowledge about composting is still low. Given that knowledge is a prerequisite for the adoption of any technology, farmers' knowledge of composting needs to be substantially improved before appreciable levels of adoption can be expected. The role of extension workers in promoting compost technology is very important. Therefore, extension workers need to intensify training and demonstrations on the use of compost and inorganic fertilizers to increase farmers' knowledge and perception of this technology. This must be done through groups to get social support, encouragement and share experiences (Mustafa-Msukwa et al, 2011). The impact of the mentoring role in the community empowerment program is (1) the development of breeder institutions and their members, communal pens and shared pastures; (2) economic development for the community so that they have both primary and secondary employment opportunities because they receive capital assistance so that farmers' income increases; (3) social changes that foster new networks or relationships that are useful for the livestock community and increase community cooperation from various parties including the government (Ikballudin et al, 2022). Training on livestock waste management conducted by Purnamasari, et al (2020) succeeded in increasing livestock farmers' knowledge in managing livestock waste and turning the results into income. Apart from that, knowledge regarding the negative impacts of not managing livestock waste also needs to be promoted so that the livestock waste processing program can continue. Based on the statement by Sampat et al (2018), livestock waste can cause a decrease in air quality due to ammonia and methane emissions, a decrease in soil quality due to excess nutrients and acidification, as well as water pollution problems due to runoff of nutrients and pathogens into water bodies, which causes eutrophication. algae growth, and hypoxia.

Providing education regarding the potential for waste processing to make money or save electricity (biogas). Providing education regarding the benefits of

managing livestock waste is expected to increase farmers' motivation in managing their livestock waste. Extension agents also need to provide marketing strategies and access for breeders who want to sell their composted fertilizer. According to Ariningsih et al (2022), the lack of incentives, no marketing assistance and no sanctions for disposing of waste carelessly makes farmers reluctant to process livestock waste. Therefore, the government's role in providing motivation and assistance to livestock farmers needs to be increased so that waste processing programs can continue to run and receive attention. Processing livestock waste into organic fertilizer can increase farmers' income. However, the weakness of this processing is the long time required to process feces and urine into fertilizer (Fitriyanto et al, 2015).

The training carried out will improve the skills of farmers or local residents in making biogas. There is training that can be carried out in biogas management, namely (Bagye et al, 2022), Basic Biogas Concept Theory which discusses the theory of gas formation from biological sources in anaerobic chambers, Theory of Various Biogas Reactors and Investment Costs which discusses various reactor models and materials. biogas and its costs, advantages and disadvantages, Theory of Various Sizes of Fixed Dome Biogas which discusses the size and need for raw materials as well as the number of households using biogas reactors on a scale of 4, 6, 8, 10 and 12 Cubic Meters, Practices for submitting and selecting quality materials applying local material testing techniques in the form of sand and red brick, Practice Layout of Various Biogas Fixeddome sizes ranging from 4 to 12 cubic meters as a team, Practicum for building a 4 cubic meter fixeddome biogas reactor which is a demo plot of a 4 cubic meter scale reactor, Practice gas pipe piping using PVC AW pipes starting from the Main Gas Pipe (PGU) to the biogas stove installed in the kitchen. Operational and maintenance theory and practice which includes how to operate each part of the biogas reactor, biogas equipment and equipment installed in the kitchenProviding education about the potential for waste processing to make money or save electricity (biogas).

Processing livestock waste into organic fertilizer can increase breeders' income. However, the weakness of this processing is the length of time it takes to process feces and urine into fertilizer (Fitriyanto et al, 2015). The training carried out will improve the skills of farmers or local residents in making biogas. There is training that can be carried out in biogas management, namely (Bagye et al, 2022): (1) Basic Biogas concept theory which discusses the theory of gas formation from biological sources in anaerobic spaces. (2) Theory of various types of biogas reactors and investment costs which discusses various biogas reactor models and materials with their costs, advantages and disadvantages. (3) Theory of various sizes of Fixeddome Biogas which discusses the size and need for raw materials as well as the number of households using 4, 6, 8, 10 and 12 Cubic Meter scale biogas reactors. (4) Practice of submitting and selecting quality materials that implement local material testing techniques in the form of sand and red brick. (5) Practical Layout of various Biogas Fixeddome sizes ranging from 4 to 12 cubic meters as a team. (6) Practicum for building a 4 cubic meter fixeddome biogas reactor which is a demo plot for a 4 cubic meter scale reactor. (7) Gas pipe piping practices using PVC AW pipes starting from the Main Gas Pipe (PGU) to the biogas stove installed in the kitchen. (8) Operational and maintenance theory and practice which includes how to operate each part of the biogas reactor, appliances and biogas equipment installed in the kitchen.

The government provides assistance in building communal biogas installations and equipment for making organic fertilizer. The creation of a biosgas installation is used to accommodate biogas produced from livestock manure. The resulting gas storage can be used directly for cooking or further purified to obtain better quality (Tira, 2014; Padang et al, 2020). Biogas purification is carried out by removing H2S which is formed during the anaerobic process. The H2S content can range between 1000 – 10,000 mg/L (Rasi et al., 2011; Faghali et al., 2020). Farmers at the research location do not have too many livestock in one family, but with adjacent houses a communal digester can be created where livestock waste from each breeder can be collected and used as alternative fuel such as lighting or for cooking. The obstacle in implementing biogas is the high installation costs. Biogas digesters have many benefits, offering additional energy, saving the environment and bonuses for the economic sector (Thu et al., 2012). To increase the amount of methane gas produced, household waste such as vegetables and food scraps can be mixed in the biodigester (Zareei, 2018). Based on research conducted by Runtuni and Dewanti (2019), capital for biogas development can come from the government or non-governmental organizations. The biogas reactor built includes renewable energy which can meet daily energy needs at low cost so that it can improve the standard of living of rural farming communities (Soeprijanto et al, 2017).

Breeders are able to implement the principles of sustainable development. By providing outreach and knowledge to breeders, it is hoped that breeders will be able to understand the importance of sustainable development in the livestock sector. Reducing the negative impact of livestock activities is important to protect the environment from damage and protect it for future generations. Biogas is a clean energy source that utilizes waste from livestock activities. Biogas is

renewable and environmentally friendly energy that can be produced in rural areas where the livestock sector is one of the economic supports (Allah et al, 2021).

After obtaining the right strategy through SWOT analysis, AHP analysis is then carried out to determine the sequence of strategies based on priority. There are 4 strategies resulting from the SWOT analysis, namely: Providing education regarding the potential for waste processing to generate money and renewable energy / First Alternative; The government provides assistance in building communal biogas installations and equipment for making organic fertilizer or a second alternative; Provide training on processing livestock waste (biogas, fertilizer, etc.) or the third alternative and provide assistance in implementing the principles of sustainable livestock / fourth alternative.

Based on 4 alternatives, questionnaires were distributed to 8 experts. Then calculations are carried out using AHP analysis.

Table 5. Final Results of AHP Analysis

	A 1	A 2	A 3	A 4	Amount	Eigenvectors
A 1	0.18	0.58	0.56	0.14	1.46	0.365
A 2	0.41	0.25	0.14	0.08	0.89	0.222
A 3	0.37	0.14	0.27	0.08	0.86	0.213
A 4	0.04	0.03	0.03	0.70	0.79	0.198

Note: A= Alternative

Based on the table above, the Eigen Vector shows the priority order for each alternative (Hafiyushaleh and Asyhar, 2016), so that the first strategic alternative sequence that needs to be implemented is alternative 1 and continued with alternatives 3, 2 and 4 sequentially.

The consistency of a matrix is carried out by measuring the consistency ratio or CR which is obtained by comparing the consistency index with the random index (Hafiyushaleh and Asyhar, 2016).

λ max = (5.63 x 0.365) + (3.98 x 0.222) + (3.76 x 0.213) + (1.43 x 0.198)
= 4.03

CI = (λ max – n) / (n-1)
= 4.03 – 4 / (4-1)
= 0.03 / 3
= 0.01

R.I = 0.90 (because there are 4 criteria)

CR = CI/RI
=0.01/0.90
=0.01
= 1%

The CR value after being calculated is 10% so this value is said to be consistent, because if it is more than 10% then the data assessment must be corrected (Mario and Sasandri, 2013).

Conclusion

The results of strategy analysis using SWOT and AHP analysis show that the most suitable strategy is is a combination of Strength and Opportunity (SO), namely Providing education regarding the potential for waste processing to generate money and renewable energy / First Alternative; The government provides assistance in building communal biogas installations and equipment for making organic fertilizer or a second alternative; Provide training on processing livestock waste (biogas, fertilizer, etc.) or the third alternative and provide assistance in implementing the principles of sustainable livestock / fourth alternative.

Acknowledgments
Through this opportunity the author would like to thank all parties for their suggestions and criticisms so that this research can be completed.

Author Contributions
This article was prepared by single author

Funding
This research received no external funding.

Conflicts of Interest
The author declare no conflict of interest

References

Allah, W.E. Abd (2021). Methane production enhancement of a family-scale biogas digester using cattle manure and corn stover under cold climates. *Sustainable Energy Technologies and Assessments,* 45, ISSN 2213-1388, https://doi.org/10.1016/j.seta.2021.101163

Ambar. (2019). *Agar Pengelolaan Limbah Peternakan Bernilai Ekonomis. Fakultas Peternakan UGM*. Retrieved from http://troboslivestock.com/detail/berita/2019/12/26/57/12465/agar-pengelolaan-limbah-peternakan-bernilai-ekonomis.

Ariningsih, E. (2022). Dairy cattle manure utilization by smallholder dairy farmers in West Java, Indonesia. *E3S Web of Conferences*, 361, ISSN 2555-0403, https://doi.org/10.1051/e3sconf/202236103013

Astuti, F., Fatimah, I., Silvia, L., Purwaningsih, S. Y., & Cahyono, Y. (2023). Pemrosesan Limbah Kotoran Ternak Sapi Menjadi Pupuk Organik Ramah Lingkungan di Desa Slumbung, Kecamatan Gandusari, Kabupaten Blitar. *Sewagati*, 8(1), 1188–1194. https://doi.org/10.12962/j26139960.v8i1.810.

Bagye, W., Taufan, M., Zaen, A., Purwata, I., Imtihan, K., Ashari, M., Mutawalli, L., & Zulkarnaen, M. F.

(2022). *Prosiding Konferensi Nasional Pengabdian Masyarakat Pelatihan Tukang Biogas Sebagai Upaya Peningkatan Kebersihan Desa Wisata Bonjeruk* (Vol. 3).

Creswell, J. W. 2010. Research Design: *Pendekatan Kualitatif, Kuantitatif, dan Mixed*. Terjemahan Achmad Fawaid. Yogyakarta: Pustaka Pelajar.

Dewi, I. N., Royani, I., Sumarjan. (2020). Pemberdayaan Masyarakat Melalui Pengelolaan Sampah Skala Rumah Tangga Menggunakan Metode Komposting. *Jurnal Abdimas (Journal of Community Service)*. 2(1):12-18.

Farghali, M. (2020). Prospects for biogas production and H2S control from the anaerobic digestion of cattle manure: The influence of microscale waste iron powder and iron oxide nanoparticles. *Waste Management,* 101, 141-149, https://doi.org/10.1016/j.wasman.2019.10.003

Fitriyanto, N. A., Triatmojo, S., Pertiwiningrum, A., Erwanto, Y., Abidin, M. Z., Baliarti, E., & Suranindyah, Y. Y. (2015). *Penyuluhan Dan Pendampingan Pengolahan Limbah Peternakan Sapi Potong Di Kelompok Tani Ternak Sido Mulyo Dusun Pulosari, Desa Jumoyo, Kecamatan Salam, Kabupaten Magelang*.

Hafiyusholeh, M and Asyhar, A. H. (2016). Vektor Prioritas dalam Analytical Hierarchy Process (AHP) dengan metode Nilai Eigen. *Jurnal Matematika.* 01(02):44-49.

Hasanudin, U., Nurdin, S. U., Indraningtyas, L., & Fadhallah, G. (2022). *Pelatihan Pemanfaatan Sampah Organik Menjadi Biogas Dan Pupuk Cair*. 01(01), 70–077.

Hidayah, N., Puspitasari, I. F., Andriyani, N., & Afifah, Z. M. (2022). Studi Kelayakan Dan Dampak Ekonomi Pengelolaan Limbah Peternakan Skala Rumah Tangga. *JPE*. 16. https://doi.org/10.19184/jpe.v16i2.33351

Hikmatian, A. M., Nurlina, L., & Alim, S. (2015). *Respons Masyarakat Terhadap Pengelolaan Limbah Usaha Peternakan Sapi Perah (Kasus di Desa Margamukti Kecamatan Pangalengan Kabupaten Bandung*) Society's Responses *Toward The Dairy Farm Waste Management (A Case In The Folk Dairy Farm Margamukti Village Pangalengan Subdistrict Bandung Regency)*.

Ikballudin, Y. M., Munandar Sulaeman, & Lilis Nurlina. (2022). Pendampingan Intensif dalam Pemberdayaan Masyarakat Peternak di Desa Cilembu: Analisis Kasus Program Indonesia Gemilang LAZ Al-Azhar. *JURNAL TRITON*, 13(1), 52–66. https://doi.org/10.47687/jt.v13i1.225.

Indri A., M. Marina & Ali, M. M. (2015). *Persepsi Masyarakat Terhadap Manfaat dan Dampak Negatif Limbah Peternakan Sapi Perah (Kasus di Desa Rancamulya Kecamatan Sumedang Utara Kabupaten Sumedang*) (Public Perceptions Of Benefits And Negative Impact Of Livestock Waste Of Dairy Farm Cattle (Case In The Village Of Rancamulya Sumedang West Java)).

Irsyad, F., Yanti, D., & Andasuryani. (2018). Sosialisasi Dan Pelatihan Pemanfaatan Biogas Dari Kotoran Ternak Dan Jerami Padi Sebagai Sumber Energi Alternatif Ramah Lingkungan. *Buletin Ilmiah Nagari Membangun*, 1(03), 15-20. Retrieved from http://buletinnagari.lppm.unand.ac.id.

Matos, C.F. (2017). Biogas production from dairy cattle manure, under organic and conventional production systems. *Engenharia Agricola,* 37(6), 1081-1090, ISSN 0100-6916, https://doi.org/10.1590/1809-4430-eng.agric.v37n6p1081-1090/2017

Mario, D dan Sasandri. (2013). Penerapan Metode Analytical Hierarchy Process (AHP) dalam Menetapkan Kompetensi dan Penilaian Kinerja Karyawan (Studi Kasus PT. Mitra Cipta Kosindo Pekanbaru). *Jurnal SATIN – Sains dan Teknologi Informasi*. 2(2):37-45.

Muhammad, F., Hidayat, J. W & Wiryani, E. (2017). Pembuatan Biogas Sebagai Energi Alternatif dari Limbah Organik Berbasis Peternakan Terpadu dan Berkelanjutan di Ungaran, Kab. Semarang. *Jurnal Abdi Insani Unram*. 4(1), 39-43.

Mustafa-Msukwa, A.K. (2011). An Assessment of The Adoption of Compost Manure By Smallholder Farmers In Balaka District, Malawi. South African *Journal of Agricultural Extension*, 39, 17-25

Padang, Y. A., Mirmanto., Syahrul., Sinarep & Pandiatmi, P. (2020). Pemanfaatan Energi Anternatif dan Terbarukan. *Jurnal Karya Pengabdian*. 2(2), 77-84.

Permatasari, I. R. (2017). *Higiene, Sanitasi dan Kualitas Bakteriologis Susu Sapi di Dusun Krajan Desa Gendro Kecamatan Tutur Kabupaten Pasuruan*. Badan kependudukan dan Keluarga Berencana Nasional Provinsi Jawa Timur.

Permatasari, D. K., Syamsuhaidi, S., Binetra, T. S., Pardi, P., Sumiati, S., & Sulastri, S. (2020). Pelatihan Pengolahan Limbah Pertanian dan Peternakan Pada Masyarakat Tani Ternak di Desa Tete Batu Kecamatan Sikur Kabupaten Lombok Timur. *Jurnal Gema Ngabdi*, 2(3), 248–255. https://doi.org/10.29303/jgn.v2i3.112.

Purnamasari, D. K., Pardi, P., Wiryawan, K. G., Syamsuhaidi, S., Erwan, E., Lutfi, Y. A., & Rohmah, R. (2020). Pendampingan Usaha Beternak Secara Mandiri Dan Pembuatan Lumbung Trigona Tetebatu (Liteba) Di Desa Tetebatu Kecamatan Sikur Lombok Timur. *Abdi Insani*, 7(3), 279–287. https://doi.org/10.29303/abdiinsani.v7i3.355.

Rasi, S., Lantela, J & Rintala, J. (2011). Trace Compounds Affecting Biogas Energy Utilisation – *Review*. 52(12).

Rasyid, A., Hartati. (2007). *Petunjuk Teknis Perkandangan Sapi Potong*. Pasuruan: Pusat Penelitiandan Pengembangan Peternakan.

Royani, I., Imran, A., Firdaus, L., Fitriani, H dan Hajiriah, T. L. (2021). Pelatihan Pengolahan Limbah Rumah Tangga menjadi Zat Pengatur Tumbuh pada Tanaman. *Jurnal Pendidikan dan Pengabdian Masyarakat.* 4(3): 307-311.

Runtuni, S. Y. (2019). Pemanfaatan Biogas dan Dampaknya terhadap Kesejahteraan Keluarga Peternak Sapi Perah di Mojosongo, Boyolali. PARAMETER: *Jurnal Pendidikan Universitas Negeri Jakarta*, 31(2), 81–95. https://doi.org/10.21009/parameter.312.02.

Saidi, D. (2022). *Pegelolaan Limbah Ternak Sapi*. Penerbit LPPM UPN Veteran: Yogyakarta.

Sajuri., Badrudin, U., Rosid, A., Rozi, F., Nugroho, D. S dan Yonansa, B. A. R. (2022). Pengelolaan Limbah Ternak untuk Produksi Tanaman di Desa Tlogopakis Kecamatan Petungkriyono Kabupaten Pekalongan. *Jurna; Pengabdian Masyarakat*. 3(2):89-94.

Sampat, A.M. (2018). Economic and Environmental Analysis for Advancing Sustainable Management of Livestock Waste: A Wisconsin Case Study. *ACS Sustainable Chemistry and Engineering,* 6(5), 6018-6031, https://doi.org/10.1021/acssuschemeng.7b04657

Sari, A. I., & Emawati, S. (2020). Upaya Pengembangan Peternakan Sapi Potong Tanpa Limbah di Desa Bentangan Kabupaten Klaten. AgriHealth: *Journal of Agri-Food, Nutrition and Public Health,* 1(1), 39. https://doi.org/10.20961/agrihealth.v1i1.41103.

Soeprijanto., Suprapto., Hari, D. P., Puspita, N. F., Pudjiastuti, L., Setiawan, B., Eka, W. T., Ferdiansyah, A., Nurlaili dan Anzip, A. (2017). Pembuatan Biogas dari Kotoran Sapi menggunakan Biodigester di Desa Jumput Kabupaten Bojonegoro. *Jurnal Pengabdian Masyarakat – LPPM ITS*. 1-9.

Soadikin, M., Laylatul Husna, N., Larasati, Z., Made Lucia Damayanti, D., Luh Sri Devi Yana, N., Laila Maharani, N., Aldy Ilyawan, A., Sa, A., Nur Hazila, S., & Jupri, A. (2019). Pemanfaatan Limbah Ternak Sapi Berbasis "Agribussines Product" Di Desa Perina Kecamatan Jonggat Kabupaten Lombok Tengah, *JWD Unram*. 1(3).

Suliartini, N. W. S., Anwar, A. M., Ansori, A. A., Putri, B. R. L., Widiawati, B., Syahputra, D., Febrian, E., Amal, I. I., Diniatun, M., Mitchell, S. L., & Yanti, Y. K. (2023). Eksplorasi Dan Identifikasi Jenis Tumbuhan Obat Di Desa Wisata Kebun Kopi Senaru Sebagai Informasi Dasar Dalam Pengembangan Wisata Tanaman Obat. *Jurnal Abdi Insani,* 10(2), 1168–1182. https://doi.org/10.29303/abdiinsani.v10i2.970.

Sultan., Azmi, A., Nirwana, A., Tafsirudin, M., Herdiatmi, M., Nurhayati. (2023). Sosialisasi dan Pengolahan Kotoran Ternak Menjadi Pupuk Organik di Desa Senanggali Kecamatan Sambelaia Kabipaten Lombok Timur. *Jurnal Karya Pengabdian*, 5(1), 47-52.

Sunarsih, E. (2014). Konsep Pengolahan Limbah Rumah Tangga Dalam Upaya Pencegahan Pencemaran Lingkungan Concept Of Household Waste In Environmental Pollution Prevention Efforts. *Jurnal Ilmu Kesehatan Masyarakat.* 3(5):1620167.

Sunarto. (2003). Perilaku Konsumen. Jakarta. Amus.

Tira, H.S., (2014). *Pemanfaatan limbah ternak sapi menjadi biogas berkualitas tinggi dalam menunjang ekonomi peternak sapi serta menuju NTB lumbung biogas digester*, MP3EI Universitas Mataram, DIKTI.

Thu, C.T. Thien (2012). Manure management practices on biogas and non-biogas pig farms in developing countries - Using livestock farms in Vietnam as an example. *Journal of Cleaner Production*, 27, 64-71, https://doi.org/10.1016/j.jclepro.2012.01.006

Triatmojo, S., Erwanto, Y., Fitriyanto, N.A. (2016). *Penanganan Limbah Industri Peternakan*. Yogyakarta: Gajah Mada University Press.

Yuniar, P. S., Fuah, A. M., Studi Ilmu Perencanaan Wilayah, P., Pertanian Bogor, I., IPB Darmaga, K., & Ilmu Tanah dan Sumberdaya Lahan Fakultas Pertanian IPB, D. (2015). Analisis Potensi Pengembangan Peternakan Sapi Potong di Kota Tangerang Selatan Analysis of the Potential Beef Cattle Development in South Tangerang. *In Juni*, 3(2).

Zareei, S. (2018). Evaluation of biogas potential from livestock manures and rural wastes using GIS in Iran. *Renewable Energy*, 118, 351-356, https://doi.org/10.1016/j.renene.2017.11.026.