

Socialization of The Utilization of Goat Urine Liquid Waste as Organic Fertilizer in Klambir V Kebun Village

M. Wasito, Najla Lubis, M. Sidik Tarigan, Griya Eri Enanda

Abstract

Goat urine provides macro and micronutrients and contains plant growth regulators (PGRs). Goat urine contains 1.5% nitrogen, 0.13% phosphorus, and 1.8% potassium. Goat urine contains higher levels of the natural hormones IAA, gibberellins, and cytokinins than other livestock. Goat urine can be processed through fermentation. Fermentation is a chemical change in an organic substrate through the activity of enzymes produced by microorganisms. The results of fermented organic materials such as sugars, alcohols, amino acids, proteins, carbohydrates, vitamins, and other organic compounds are easily absorbed directly by plant roots. The use of effective microorganisms in the production of fermented goat urine liquid organic fertilizer aims to accelerate the fermentation process. Effective microorganisms, also known as probiotics, are mixed cultures of various beneficial microorganisms, such as photosynthetic bacteria, lactic acid bacteria, actinomycete yeasts, and fermentative fungi, which can improve soil microbial activity. The use of solid goat manure waste is commonplace among farmers in Klambir V Kebun village, but the use of fermented goat urine as a liquid organic fertilizer is less widely known. Therefore, efforts to optimize the use of fermented goat urine as a liquid organic fertilizer are crucial. This outreach program was conducted to provide additional information and knowledge to community groups in Klambir V Kebun village on the production of fermented liquid organic fertilizer. This effort aims to address environmental pollution and provide an alternative source of fertilizer for residents of Klambir V Kebun, especially farmers. The activity method used was lectures, discussions, and hands-on practice. The results of this outreach program on the production of liquid organic fertilizer from goat urine can help the community manage livestock waste, particularly goat urine, for greater benefits for farmers.

Keywords: Goat Urine, Waste, Fermentation, Liquid Organic Fertilizer, Outreach, Klambir V Kebun.

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2nd International Conference on Islamic Community Studies (ICICS)

Theme: History of Malay Civilisation and Islamic Human Capacity and Halal Hub in the Globalization Era

<https://proceeding.pancabudi.ac.id/index.php/ICIE/index>

Introduction

Hamparan Perak District is located within Deli Serdang Regency, North Sumatra Province. Hamparan Perak District generally has two distinct climatic seasons: the dry season and the rainy season, both influenced by sea and mountain breezes. Administratively, Hamparan Perak District borders several areas: Labuhan Deli District to the north, Sunggal District to the south, Medan City to the east, and Langkat Regency to the west. [1].

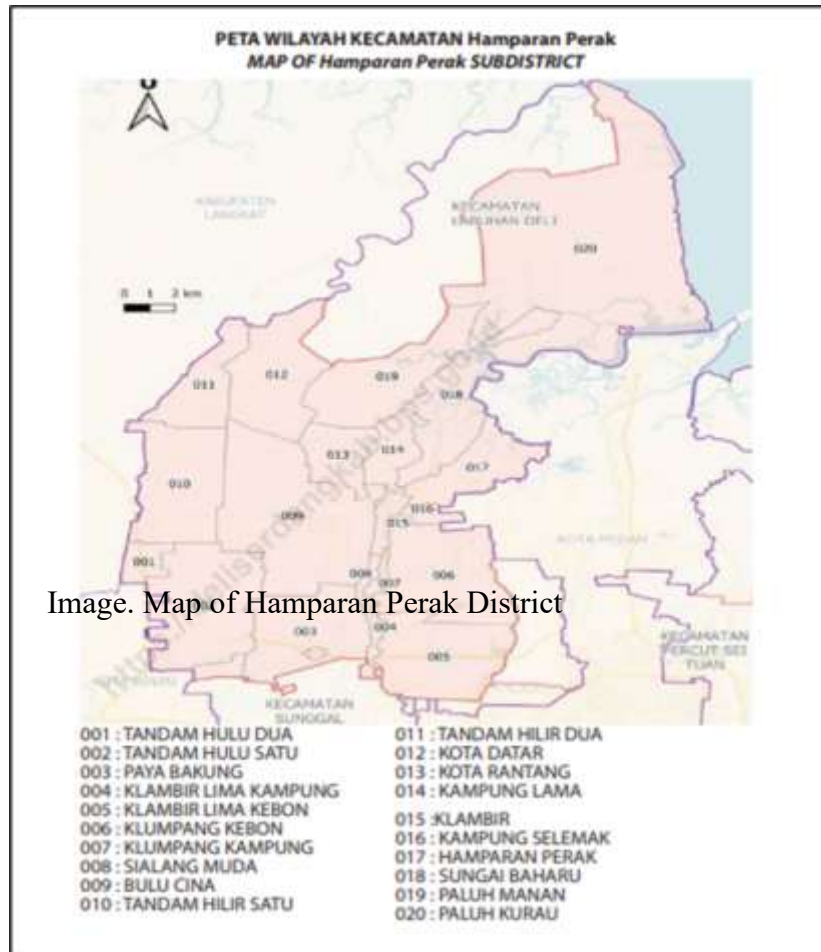


Image. Map of Hamparan Perak District

1.1 Local Resources

Klambir V Kebun Village is located in Hamparan Perak District, Deli Serdang Regency, North Sumatra Province. Klambir V Kebun Village covers an area of 25.58 km² and has a population of over 14,000. The village's population is a mix of several ethnicities, including Javanese, Malay, Batak, Karo, Minang, and Mandailing. The diverse ethnicities in this village foster a sense of egalitarianism and mutual respect. Each ethnic group maintains its own customs and culture without interference. The village boasts extensive community plantations, which are the villagers' gardens, growing crops such as corn, sweet potatoes, peanuts, and various vegetables. The village's proximity to Medan makes it a key supplier of vegetables to the city's residents.

1.2 Village Facilities and Infrastructure

Klambir V Kebun Village has several school buildings, both state-owned and private. These educational facilities include a pre-school and kindergarten building, an elementary school, a junior high school, and a high school. Therefore, it can be said that Klambir V Kebun Village has several educational facilities that are quite good at improving the intelligence of its

children. Since the residents of Klambir V Kebun Village are predominantly Muslim and Christian, the village houses of worship, including mosques and churches, which are located in several hamlets. Klambir V Village also has offices for a state-owned bank (BRI) and a regional bank (Bank Sumut).

1.3 Village Potential Aspects

One of the potential areas developed in Klambir V Kebun Village is agricultural land, producing secondary crops, vegetables, and livestock. This is due to the suitable climate, good soil, and good rainfall. Land use in Klambir V Kebun Village is for gardens and dry fields.

The main agricultural and plantation products in Hamparan Perak District are rice, corn, coconut, soybeans, mung beans, and oil palm. Some residents also earn a living by raising livestock.

Literature Review

The majority of the population in Klambir V Kebun village are farmers. In addition to the large number of farmers, many in Klambir V Kebun village also keep livestock, such as cows, goats, chickens, and other livestock. Farmers in Klambir V Kebun village have used their solid livestock manure as fertilizer, but not many have used liquid livestock manure as fertilizer. A detailed description of the problems that prompted the need for publicizing the production of liquid organic fertilizer from goat urine is provided.

2.1 Availability of Goat Urine Raw Materials

In Klambir V Kebun village, many people raise goats, and goat urine is abundantly available. However, its utilization remains minimal because few people know that the urine can be processed into a liquid fertilizer that is very beneficial for plants. Goat urine is often simply discarded and considered waste. According to [2], with proper handling, goat urine can be fermented into a liquid fertilizer rich in nitrogen, phosphorus, potassium, and various beneficial microbes that help fertilize the soil. With an abundance of raw materials that are not utilized, farmers miss out on opportunities to obtain quality fertilizer for free or even save money. Furthermore, unmanaged goat urine waste can produce an unpleasant odor and pollute the surrounding environment.

Fertilizer is a crucial component and a key production factor for agricultural commodities. Based on their chemical composition, fertilizers are divided into two types: organic and inorganic. Organic fertilizers can address the negative effects of continuous high-dose inorganic fertilizer use. There are two types of organic fertilizer derived from animal waste: solid organic fertilizer and liquid organic fertilizer. Livestock waste is waste obtained in large quantities and can be used as organic fertilizer. Livestock waste can be in the form of solid waste (feces) and liquid waste (urine). Livestock waste generally includes all waste generated from livestock operations, including solid and liquid waste, gas, and leftover feed [3].

Urine is a liquid waste found in animal husbandry. Urine is formed in the kidneys after being eliminated from the body through the urinary tract and is derived from nitrogen metabolism (urea, uric acid, and creatinine). Urine consists of 90% water. The urine produced by livestock is influenced by food, livestock activity, external temperature, water consumption, season, and so on. The amount of feces and urine produced is 10% of the livestock's weight. Of that not insignificant amount, it turns out that every 2.5 liters of goat urine contains approximately 1.13% Nitrogen (N), 0.05% Phosphorus (P), 7.90% Potassium (K), and a pH of 8.71. An adult goat can produce approximately 0.6-2.5 liters of urine/day, making urine a highly potential commodity for generating high economic value for the livestock industry. The ratio of feces and urine produced by livestock is 1.2:1 for pigs (55% feces, 45% urine), 2.4:1 for beef

cattle (71% feces, 29% urine), 1:1 for goats (50% feces, 50% urine), and 2.2:1 for dairy cattle (69% feces, 31% urine) [4]

Table 1. Chemical Components of Cow, Rabbit, and Goat Urine

Analysis Type	Cow Urine	Rabbit Urine	Goat Urine
pH	8.25	8.21	8.71
Total N (%)	0.23	0.10	1.13
P ₂ O ₅ (%)	0.07	0.04	0.05
K ₂ O (%)	1.70	2.11	7.90

Source: Ardiyansyah et al., 2021

2.2 Dependence on Chemical Fertilizers

Many farmers in Klambir V Kebun village have long relied on chemical fertilizers because they are accustomed to seeing quick results in their crops. They believe that using chemical fertilizers is an effective way to increase land productivity. According to [5] the continuous, long-term use of chemical fertilizers can damage soil structure and reduce its natural organic matter content. Soil that is frequently fertilized becomes hard, compacted, and loses its natural ability to retain water and nutrients properly. Soil fertility decreases, requiring farmers to use more chemical fertilizers to maintain the same yield. This creates a long-term dependence on chemical fertilizers, which is ultimately inefficient and unsustainable.

2.3 High Fertilizer Costs

The price of chemical fertilizers has been rising, especially since the policy of reducing fertilizer subsidies. Smallholder farmers often feel the financial impact, as they need to allocate a large portion of their budget to fertilizer purchases. Many farmers experience financial difficulties due to high production costs, while market prices are often unstable. They must work hard to maintain a profit or simply survive. High expenditures on chemical fertilizers reduce farmers' net income. Meanwhile, soil quality is declining, threatening their long-term profitability [6]

2.4 Lack of Knowledge about Organic Fertilizers

Organic fertilizers are often unknown to farmers or considered less effective than chemical fertilizers. They may have heard about their benefits, but many don't understand how to make or use them. This lack of knowledge makes farmers hesitant to switch to organic fertilizers, even though they are more economical and have a positive long-term impact on soil and environmental health. Without sufficient knowledge, the enormous potential of natural materials like goat urine is wasted. Farmers are unable to utilize local resources that could provide equally good results, at lower costs and with greater environmental benefits. [7]

2.5 Environmental Damage and Soil Pollution

Excessive use of chemical fertilizers can contaminate the soil and water sources around agricultural areas. When chemical elements accumulated in the soil seep into groundwater, this can cause detrimental pollution. Soil contaminated with chemical fertilizers can lose its natural nutrients, thus affecting the quality of the crops produced. Declining water quality. Furthermore, water pollution can impact public health and reduce the quality of clean water sources around agricultural areas. The soil becomes increasingly depleted of natural nutrients, disrupting the ecosystem around agricultural areas, and threatening environmental health. Liquid organic fertilizer from goat urine can be a more environmentally friendly solution, as it does not cause pollution and supports ecosystem sustainability. [8]

2.6 Declining Soil Fertility

Soil in agricultural land that is continuously cultivated often experiences declining fertility. This condition is exacerbated by the excessive use of chemical fertilizers. With the reduction in organic matter and beneficial microorganisms in the soil, land productivity decreases. Plants growing in less fertile soil cannot grow optimally and are even more susceptible to disease. Farmers must work harder to achieve the same yield, often at greater additional costs. Furthermore, infertile soil takes a long time to recover and can affect future harvests. Liquid organic fertilizer from fermented goat urine contains microbes that can help improve soil structure and increase its organic matter content. [8]

Organic fertilizer is defined as fertilizer Organic fertilizers are derived in whole or in part from engineered plants and/or animals. They can be in solid or liquid form and are used to supply organic matter to improve the physical, chemical, and biological properties of the soil (Minister of Agriculture Regulation Number 2 of 2006). Organic fertilizers come in various types and variants. These types of organic fertilizers are distinguished by their raw materials, manufacturing methods, and form. Some are made from animal manure, green fodder, or a mixture of both. There are many different manufacturing methods, such as aerobic compost, bokashi, and others. In terms of form, some are available in powder, liquid, granules, or tablets. [9]

Organic fertilizer technology is developing rapidly today. This development is inseparable from the impact of chemical fertilizer use, which causes various problems, ranging from ecosystem damage and loss of soil fertility to health problems and even increasing farmer dependence on fertilizers. Therefore, the use of organic fertilizers is being re-instructed to address these issues. Various types of organic fertilizers are used by farmers in the field. In general, organic fertilizers are distinguished by their form and composition. Based on their form, organic fertilizers are classified as: Liquid and solid. Based on their composition, there are green manure, manure, and compost. [9]

Liquid organic fertilizers contain macro and micronutrients, including N, P, K, S, Ca, Mg, B, Mo, Cu, Fe, and Mn, along with organic materials. Liquid organic fertilizers are made through anaerobic fermentation, where fermentation is carried out in a closed system without the presence of oxygen (Soeleman and Rahayu, 2018). Plants' nutrient needs are met in liquid organic fertilizers, which contain nitrogen for stem, shoot, and leaf growth. Phosphorus stimulates root, seed, and fruit growth. Potassium increases plant resistance to pests and disease [10]

2.7 Lack of Additional Income from Livestock Waste

Livestock waste, such as goat urine, has high potential to be turned into economically valuable products, but many farmers have yet to see this as an opportunity. Lack of information and knowledge leads to this waste being left untreated, or at most, being used as solid fertilizer without prior fermentation. However, through the fermentation process, goat urine can be converted into high-quality liquid fertilizer with a marketable value. Farmers are missing out on an opportunity to generate additional income from liquid fertilizer products. If this outreach is successful, farmers could make and sell liquid fertilizer from fermented goat urine, providing a positive economic impact for them. [7]

Research Methodology

An effective approach to promoting the production of liquid organic fertilizer from fermented goat urine combines elements of education, hands-on practice, and active community involvement. The following methods were used in this activity:

3.1 Participatory Approach.

Objective: To encourage farmers to actively participate in the outreach activities and to make them feel a sense of ownership. This is important for farmers to be more confident in applying new knowledge to their own land.

Rationale: A participatory approach helps farmers feel more involved, thereby increasing their sense of responsibility for the success of the practices taught. Through active interaction, farmers can exchange information and learn from each other's experiences.

Implementation: Group Discussion: Prior to the main outreach activity, a focus group discussion was held to explore farmers' problems and needs related to fertilizer use. This aimed to make the outreach activities more relevant to local conditions and needs.

Q&A and Experience Sharing Session: After the explanation and demonstration, the facilitator provided dedicated time for farmers to ask questions, share their own experiences in managing fertilizer, and discuss the benefits they expected from using liquid organic fertilizer.

3.2 Demonstration.

Purpose: To demonstrate firsthand how to make liquid organic fertilizer from goat urine, so farmers can see the process in action and understand the techniques and steps involved.

Reason: Field demonstrations are effective because farmers generally learn more easily through hands-on practice than simply listening to theory. This hands-on experience also helps farmers become more confident in trying it themselves.

Implementation: Preparation of Materials and Tools: The facilitator brings all the necessary materials and tools, such as a drum or large container, goat urine, and additional ingredients for fermentation.

Demonstration Steps: The demonstration involves practicing each step, from collecting goat urine, adding fermentation ingredients, stirring, and storing the fertilizer. Farmers are encouraged to take an active role, for example, by holding tools or participating in the mixing process.

Discussion on Fermentation Time and Application: After the demonstration, the facilitator explains the fermentation time and how to apply it to the farm.

3.3 Educational Approach through Visual Materials

Purpose: To provide educational materials that farmers can take home and review so they can better understand and remember the steps for making and the benefits of organic fertilizer.

Reason: Visual materials such as modules will help farmers who may have forgotten or not yet fully grasped the liquid fertilizer production process. With materials readily accessible, their understanding will be enhanced.

By implementing this method, the socialization of the production of liquid organic fertilizer from fermented goat urine is expected to provide a deeper understanding, sustainable practices, and a positive impact on more environmentally friendly and economical agricultural practices for farmers.

a. Work Procedures

The work procedures to be implemented include:

Lecture material will be provided to participants in module form, followed by discussion (Q&A) and hands-on field practice.

a) Sustainable agriculture and organic fertilizer (Lecturer: M. Wasito).

b) Provision and preparation of materials for making goat urine fertilizer (POC): (M. Sidik Tarigan)

c) Procedure for making goat urine fertilizer (Lecturer: Najla Lubis)

d) Practical goat urine fertilizer (Director: M. Wasito and the entire team)

e) Documentation: ((Griya Eri Enanda)

b. Timeline

This activity will be held on Sunday, May 25, 2025, in Klambir V Kebun Village, Hamparan Perak District.

c. Partner Participation Description

In this outreach on goat urine fertilizer production, the Klambir V Kebun Village community participated by providing ingredients such as goat urine, Eco Enzyme, molasses, jerry cans, and other materials.

3.4 Evaluation of the Community Service Program Implementation

After learning how to make the Liquid Organic Fertilizer (POC), it is hoped that this will raise public awareness of the beneficial uses of goat urine waste, thereby reducing environmental pollution, particularly air pollution caused by the unpleasant odor of the waste.

The POC, which has been fermented for 14 days, can be harvested and used for plant fertilization. The implementation team will conduct monitoring and evaluation for this evaluation.

Results

The proposed outcome for partner issues is to provide counseling or outreach on the production of fermented goat urine liquid organic fertilizer. This training will include training on the production and application of liquid organic fertilizer. This training will teach farmers how to make fermented liquid organic fertilizer through hands-on training using goat urine provided by the community. It will also teach them how to use and utilize liquid organic fertilizer for plants.

To address the challenges faced by farmers regarding fertilizer use and to support sustainability and the local economy, the following solutions can be provided through outreach on the production of fermented goat urine liquid organic fertilizer. Each solution targets a specific identified problem:

4.1 Reducing Dependence on Chemical Fertilizers through Organic Fertilizer Education.

Provide training on the benefits and effectiveness of fermented goat urine liquid organic fertilizer, which is nutritionally complete and meets plant needs. Through this outreach, farmers will understand that liquid organic fertilizer can be a safe and sustainable alternative to chemical fertilizers. This education can be delivered through presentations, group discussions, and field demonstrations, so farmers can directly understand how to make and use it. [7]

4.2 Providing a More Affordable Alternative to Fertilizer

Encourage the use of readily available materials, such as goat urine, which is available for free or at very low cost. Farmers can use this livestock waste as a fertilizer source without having to rely on expensive chemical fertilizers. In this outreach, we can demonstrate practical steps on how to collect, store, and process goat urine into liquid fertilizer, so farmers can produce it independently at minimal cost.

4.3 Improving Knowledge of Organic Fertilizer

Provide detailed and easy-to-understand training materials so that farmers understand the production, advantages, and application steps for liquid organic fertilizer made from goat urine. With this understanding, they will not only understand its benefits but also develop the skills to make and use it. This outreach can be accompanied by simple PowerPoint presentations containing information about organic fertilizer, including how the fermentation process works, the nutrients it contains, and how to apply it effectively in the field.

4.4 Optimizing the Availability of Goat Urine Raw Materials in Klambir V Kebun Village

Develop guidelines and techniques for storing and processing goat urine to ensure that available raw materials are not wasted. Furthermore, with these guidelines, livestock waste can be used as the main raw material in the production of liquid organic fertilizer. Through field practice, farmers can learn how to hygienically collect livestock urine and store it under proper conditions before fermentation. This fermentation process involves activated bacteria to increase the nutrient content of the urine, resulting in a high-quality liquid fertilizer.

4.5 Prevent Environmental Damage by Introducing Eco-Friendly Organic Fertilizer

Liquid organic fertilizer made from goat urine has a more environmentally friendly impact than chemical fertilizers. During outreach, it is important to explain how this organic fertilizer can improve soil quality without polluting the environment. During demonstrations, it can be shown that organic fertilizer does not damage soil structure or pollute water sources around the farm. This information can help educate farmers about the importance of protecting the environment while still achieving optimal agricultural yields. [11].

4.6 Addressing Declining Soil Fertility with Natural Nutrients from Organic Fertilizer

Liquid organic fertilizer made from fermented goat urine contains microbes that help improve soil structure, restore natural organic matter, and increase the soil's ability to retain water and nutrients. This way, soil fertility can be improved and maintained long-term. Outreach can be supplemented with data or real-world examples (e.g., case studies from other locations) that demonstrate the results of using liquid organic fertilizer in improving soil. Direct application in the field can also provide concrete evidence to farmers. [10]

4.7 Providing Additional Income Opportunities with Organic Liquid Fertilizer

Liquid fertilizer made from fermented goat urine can be sold as an organic product on the market. With the training provided, farmers can not only produce fertilizer for their own needs but also sell it to generate additional income. In addition to production training, this outreach can include marketing insights for farmers who want to sell their liquid fertilizer. Information on packaging, pricing, and local sales can be included so they can use this liquid fertilizer as an additional source of income. [10]

The results of this outreach can have long-term impacts, ranging from knowledge and economic benefits to positive environmental impacts. It is hoped that farmers can implement it effectively, thus creating a more sustainable agricultural system.

Conclusion

From the implementation of the activity of making liquid organic fertilizer from goat urine, the following conclusions can be drawn.

1. The use of goat urine organic fertilizer can reduce dependence on chemical fertilizers.
2. Liquid organic goat urine fertilizer can provide a more affordable alternative fertilizer.
3. Organic fertilizer can address declining soil fertility with natural nutrients.
4. The use of liquid organic goat urine fertilizer prevents environmental damage, thus creating a sustainable agricultural system.
5. The production of liquid organic goat urine fertilizer can create additional income opportunities for livestock breeders and farmers.

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