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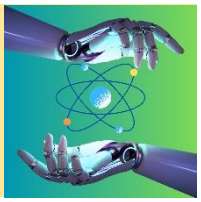

Socialisation of Silage Feed Production for the Livestock Group of Baroh Village, Montasik Subdistrict, Aceh Besar Regency

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Abstract

The Community Service (CS) program, entitled "Socialisation of Silage Feed Production for the Baroh Village Livestock Group, Montasik District, Aceh Besar Regency," was implemented as an effort to address the problem of limited forage availability, particularly during the dry season. The main objective was to equip farmers with knowledge and practical skills related to the concept, benefits, and techniques of silage production as a high-quality, storable, and easily applicable feed alternative. The methods applied included counselling sessions, interactive discussions, and hands-on silage production practices using natural grasses and locally available materials. The results showed that farmers actively participated in the entire activity, gained a deeper understanding of the importance of silage technology, and were able to apply simple ensiling techniques. Overall, this Community Service Program (PkM) contributes to strengthening farmers' capacity in providing alternative feed resources, supporting the sustainability of livestock farming, and potentially improving both productivity and the welfare of livestock groups in Baroh Village, Montasik District, Aceh Besar Regency.

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1. Introduction

Livestock farming is one of the key sectors in supporting food security and community livelihoods, particularly in rural areas. One of the significant challenges faced by farmers is the limited availability of forage throughout the year. During the rainy season, forage is generally abundant, while in the dry season, its availability becomes very limited. This condition often leads to a decline in livestock productivity due to a shortage of high-quality feed [1]–[3]. One potential solution to this problem is the application of feed preservation technology, such as silage. Silage is a type of preserved feed produced from fermented forage or agricultural residues under anaerobic conditions, enabling it to maintain its nutritional value and be stored for relatively long periods [4]–[6]. In addition to ensuring feed availability, silage can also enhance the efficiency of local resource utilisation, reduce production costs, and improve livestock performance [7]–[9].

In Baroh Village, Montasik Sub-district, Aceh Besar Regency, most livestock farmer groups still rely on fresh forage without applying feed preservation techniques. This condition has caused feed imbalance during certain seasons, which negatively affects livestock growth and productivity. Meanwhile, the potential raw materials for silage production, such as elephant grass, rice straw, and agricultural by-products, are abundantly available in the region yet remain underutilised [10]–[12].

Furthermore, the adoption of silage technology aligns with the concept of sustainable agriculture, which emphasises the efficient and sustainable use of local resources [13]–[15]. By adopting this technology, farmers can reduce their dependence on commercial feeds, whose prices are often volatile. This is particularly important in maintaining the stability of smallholder livestock systems, which generally face limited access to capital and modern technology [16]–[18].

Based on these conditions, it is necessary to conduct socialisation and training on silage production for livestock farmer groups in Baroh Village. Such activities are expected to improve farmers' knowledge and skills in processing locally available feed resources into high-quality silage. Consequently, the availability of feed can be better guaranteed throughout the year, livestock productivity can be improved, and the welfare of farmers can be enhanced. The specific objectives of this community service program are threefold: (1) to increase farmers' understanding of the importance of silage as an alternative feed resource, (2) to improve practical skills in silage production using locally available forages and agricultural residues, and (3) to promote the adoption of silage technology as a sustainable solution to seasonal feed shortages. By addressing both theoretical knowledge and practical skills, this program aims to foster long-term behavioural change among livestock farmers.

Compared with previous studies that primarily focused on laboratory-scale silage trials or nutritional evaluations [19]–[21], this program emphasises direct community engagement and participatory approaches. The integration of counselling, interactive discussions, and hands-on practices ensures that farmers not only gain knowledge but also acquire confidence in independently producing silage. This practical orientation represents a novelty by bridging the gap between academic research and the real-world needs of farmers. Moreover, the uniqueness of this program lies in its contextual approach, which is tailored to the specific conditions of Baroh Village. While many studies have investigated silage quality from various forages [22]–[24], limited research has highlighted the empowerment of smallholder farmers through training and mentoring activities. Thus, this initiative contributes not only to the improvement of local livestock productivity but also to the development of a replicable model of community-based feed innovation in rural Indonesia.

2. Methodology

In the implementation of this Community Service (PkM) program, the organising team carried out several structured and systematic activities, namely:

1. Initial Coordination and Problem Identification
   The team conducted coordination with the village authorities and the livestock farmer groups of Baroh Village to establish communication, understand field conditions, and identify the problems faced by farmers regarding forage availability, particularly during the dry season. This activity was intended to ensure that the solutions provided were aligned with the actual needs of the farming community.
2. Socialization and Counseling Sessions
   The team delivered materials on the importance of silage as an alternative method of forage preservation. The presentation included the basic concepts of silage, its benefits, the principles of anaerobic fermentation, and the nutritional value of silage compared to fresh forage. The session was followed by interactive discussions between lecturers and farmers to address field-related issues.
3. Silage-Making Simulation
   The lecturers conducted a hands-on demonstration of silage production using locally available materials, including native grasses, rice bran, molasses, EM-4 (effective microorganisms), minerals, salt, and sufficient water. Participants were directly involved in the process, from chopping the grasses to mixing supplements such as rice bran and adding feed additives like molasses, minerals, and salt, to the packaging of the feed in airtight plastic bags or drums. The application used simple, low-cost, and farmer-friendly techniques. The simulation aimed to ensure that knowledge was not limited to theory but was also mastered as practical skills through direct practice.

4. Discussion and Q&A Session
   Following the silage-making simulation, the activity continued with a discussion and question-and-answer session on forage preservation using the silage method. The discussion focused on potential challenges farmers may face in adopting silage technology sustainably and on the impacts of silage application on cattle and goat feed management.
5. Publication and Documentation
   The activities were documented for the purpose of reporting the PkM program as well as for scientific publications and community service dissemination, so that they may serve as a reference and example for other villages in the Aceh Besar area.

3. Result & Discussion

a. Socialisation and Material Delivery
The concept of silage feed, its benefits, and its advantages compared to fresh forage were introduced. Silage is a forage preservation technology through anaerobic fermentation that utilises lactic acid bacteria to reduce pH, thereby inhibiting the growth of spoilage microorganisms [25][25]. This process allows perishable forage, which typically deteriorates rapidly in quality, to be preserved in the form of fermented feed with relatively stable nutrient content and availability throughout the year [26]. Thus, silage becomes a strategic alternative to address the fluctuating availability of fresh forage, particularly in tropical regions with prolonged dry seasons.
Additionally, silage offers nutritional benefits for ruminants. The fermentation process during ensiling can enhance energy availability, improve fibre digestibility, and modify the fatty acid composition that animals consume [27]. From a practical perspective, silage has advantages over fresh forage because it can be stored for extended periods without significant deterioration in quality. Supplementation with probiotics (5–15 ml) in silage has also been shown to increase protein and fat content in native grass-based silage [28]. On the other hand, fresh forage is often constrained by weather dependency, distribution limitations, and high labour demands for daily harvesting and provision. Silage reduces these dependencies by providing a readily available feed reserve that is more efficient to handle.
Overall, the concept of silage feed represents a strategic approach to improving livestock production efficiency. With stable feed availability, preserved nutritional quality, and improved storage and distribution efficiency, silage makes a substantial contribution to the sustainability of modern livestock systems [29]. Therefore, compared to fresh forage, which is highly perishable, silage is proven to be superior in terms of quality, quantity, and continuity of feed provision for ruminants.

b. Interactive Discussion with Farmers
An interactive discussion was held with farmers to explore in depth the actual challenges they face in providing forage for livestock. The dialogue revealed that the main problem is the inconsistent availability of forage, particularly during the dry season when grass growth is severely limited. Farmers also highlighted constraints such as limited land for intensive forage cultivation, as well as the high labour and financial costs required to collect and provide fresh forage on a daily basis. These conditions often result in inconsistent feed quality and quantity, ultimately affecting livestock productivity.
During the discussion, potential solutions were also explored, particularly the application of silage technology. Farmers were introduced to the concept that forage abundance during the rainy season could be preserved through anaerobic fermentation into silage, thereby ensuring feed availability during periods of scarcity. This technology is considered capable of maintaining nutrient content, minimising dry matter losses, and enhancing feed utilisation efficiency.
Beyond the technical aspects, the discussion also covered the practical advantages of silage adoption, including reduced dependency on weather, year-round feed reserves, and easier storage and distribution. Farmers who initially expressed concern about risks of spoilage or quality loss were provided with explanations about proper silage-making techniques, the use of additives (inoculants), and correct storage practices to maintain quality.

Through this discussion, farmers became increasingly aware that silage technology can serve as a sustainable solution to feed scarcity. They were also encouraged to directly practice silage-making using locally available forage, ensuring that the knowledge gained was not only theoretical but also applicable to daily livestock management.

c. Silage-Making Demonstration

The demonstration explained the step-by-step procedure of silage production, from forage cutting and mixing to packaging.

Silage-making is a forage preservation method designed to maintain nutrient quality for extended periods through anaerobic fermentation. Native grasses, typically a mixture of different species, are harvested during the vegetative to early generative stage, when crude protein content and digestibility are relatively high. After harvesting, the forage is wilted for 4–6 hours until the moisture content reaches approximately 60–70%. This wilting stage is essential to reduce excess moisture, which otherwise may result in poor-quality silage dominated by butyric acid fermentation [23].

Once wilted, the forage is chopped into pieces 2–5 cm in length. Chopping reduces particle size, facilitates compaction, accelerates microbial activity, and improves homogeneity within the silo. At this stage, additives or inoculants, such as commercial lactic acid bacteria or soluble carbohydrate sources (e.g., molasses), can be added to accelerate pH reduction and support a more stable fermentation [30].

The chopped forage is then placed into airtight storage containers or silos (such as plastic drums, airtight plastic bags, or concrete silos). Each layer must be compacted firmly to expel air and create anaerobic conditions. Proper compaction is crucial, as residual oxygen can trigger the growth of spoilage microorganisms and reduce silage quality [25].

After filling, the silo is sealed tightly with airtight plastic to prevent oxygen and rainwater infiltration. Fermentation typically lasts 21–30 days, indicated by a fresh acidic aroma and forage texture that remains intact but becomes softer. Good-quality silage is generally greenish-brown in colour, has a pleasant lactic acid aroma, is free of slime, and exhibits no fungal growth. With correct procedures, native grass silage can serve as a stable, nutritious, and year-round feed source for ruminants.

d. Farmer Participation in the Demonstration

Livestock farmer groups directly observed the silage-making process and practised the techniques themselves under the guidance of the program facilitators. This hands-on approach ensured that farmers not only gained theoretical knowledge but also developed the practical skills necessary to produce silage using locally available resources independently.

Figure 1: Silage-Making Materials and Equipment

Figure 1 shows the materials and equipment used in the silage-making process. The primary ingredients include native grass as the main forage, rice bran as a supplemental energy source, molasses to provide fermentable sugars, EM-4 (Effective Microorganisms) as a microbial inoculant, and additional minerals

and salt to enhance the nutritional balance of the silage. These components play a crucial role in ensuring proper fermentation under anaerobic conditions, which is essential for preserving the nutritional value of forage and preventing spoilage. In addition, supporting equipment such as airtight plastic bags, a wheelbarrow, and containers is prepared to facilitate the chopping, mixing, and compacting process. The selection of these materials reflects the use of locally available and affordable resources, making silage technology more practical and applicable for smallholder farmers. By combining natural forage with additives such as molasses and EM-4, farmers can accelerate lactic acid fermentation, reduce pH more effectively, and produce silage with higher stability and nutritional quality. The availability of simple tools and inexpensive packaging methods ensures that this practice can be adopted widely without requiring advanced technology or high costs. Thus, the materials and equipment illustrated in Figure 1 represent an appropriate and sustainable approach to improving feed preservation in rural livestock systems.

Figure 2 illustrates freshly chopped forage (native grass), which serves as the primary raw material in silage preparation. Native grass is commonly used in smallholder livestock systems because it is readily available, grows naturally in rural areas, and can be harvested at relatively low cost. Chopping the grass into smaller pieces is an essential step that improves compaction, reduces oxygen presence, and accelerates the fermentation process. By ensuring the forage is properly chopped, lactic acid bacteria can act more effectively, leading to faster pH reduction and preservation of nutrients during ensiling. The use of native grass also highlights the potential for optimising local resources to mitigate feed shortages during the dry season. Although its nutritional quality may not be as high as cultivated forages such as Napier grass, the ensiling process can enhance digestibility and prolong its availability. For farmers in areas with limited access to commercial feed, processing native grass into silage provides a practical and sustainable solution. Therefore, the freshly chopped forage shown in Figure 2 represents the foundation of silage technology, turning a readily available but perishable resource into a long-lasting and nutritionally stable feed alternative for ruminants.

Figure 2: Freshly Chopped Forage (Native Grass) for Silage Preparation

Figure 3 illustrates the demonstration of the silage-making process, which involves active participation from farmers. In this stage, the facilitators guided farmers through practical steps such as chopping forage, mixing it with supplementary ingredients, and preparing it for storage in airtight containers. Direct involvement of farmers in this process is crucial, as it transforms theoretical knowledge into tangible skills that can be applied in daily livestock management. By practising the techniques themselves, farmers gain confidence in their ability to replicate the process independently. This participatory approach also strengthens the sustainability of the program, as farmers are not passive recipients of information but become directly engaged in problem-solving. Through interactive demonstrations, farmers can gain a deeper understanding of the importance of precision in forage chopping, compaction, and airtight sealing to ensure high-quality silage. Moreover, group-based

learning fosters collaboration among farmers, encouraging collective adoption of silage technology within the community. Thus, the activity shown in **Figure 3** demonstrates the value of experiential learning in promoting technological innovation and capacity building for smallholder livestock farmers.

Figure 3: Demonstration of Silage-Making Process with Farmer Participation

Figure 4 presents a group photo taken after the silage-making training activity, featuring the implementing team together with livestock farmers from Baroh Village. This photo symbolises the collaborative spirit of the program, where academic facilitators and local farmers worked hand in hand to address challenges in forage preservation. The silage products displayed in the front serve as tangible evidence of the training outcomes, demonstrating that participants successfully practised the ensiling process. Such documentation also underscores the significance of knowledge transfer through community service programs, thereby bridging the gap between academic expertise and rural farming practices. Beyond serving as a record of the event, the group photo also reflects the social aspect of capacity-building initiatives. It emphasises the sense of ownership and collective achievement among participants, which is crucial for sustaining technology adoption beyond the program's duration. Farmers who feel engaged and supported are more likely to continue applying the skills learned and share them with others in their community. Thus, **Figure 4** not only documents the completion of the training but also represents the foundation of long-term empowerment and innovation in livestock feed management.

Figure 4: Group Photo after Silage-Making Training Activity

4. Novelty of the Study

The novelty of this study lies in its community-based approach to introducing and disseminating silage-making technology among smallholder farmers in Baroh Village, Montasik District, Aceh Besar Regency. While previous research has primarily focused on laboratory-scale experiments or nutritional evaluations of silage using various forage crops, this program emphasises the direct transfer of knowledge and practical skills through participatory methods. By involving farmers not only as passive recipients of information but as active participants in hands-on demonstrations, this study bridges the gap between academic research and grassroots implementation of feed innovation.

Another aspect of novelty is the utilisation of locally available materials, such as native grasses, rice bran, molasses, EM-4, minerals, and salt, to produce high-quality silage. Unlike studies that rely on specific cultivated forages or imported inoculants, this program highlights the feasibility of adapting silage technology to local conditions with minimal costs. This ensures that the technology is sustainable, easily replicable, and accessible to smallholder farmers with limited financial resources. Furthermore, this study introduces a model of integration between training, mentoring, and community empowerment. Beyond technical skill development, the program fosters collective awareness among farmers about the importance of feed preservation for livestock productivity and farm sustainability. This combination of practical training, problem identification, and group-based learning distinguishes the study from prior works that focused solely on technical aspects of silage fermentation. Therefore, the study contributes not only to livestock feed technology but also to the broader field of rural community development and sustainable agriculture.

5. Conclusion

The Community Service CS) activity in Baroh Village, Montasik District, Aceh Besar Regency, was successfully carried out in accordance with the planned objectives. Through this program, farmers gained a better understanding of the importance of silage technology as a solution for providing high-quality alternative feed, particularly during the dry season when fresh forage is scarce. The results of the activity showed that farmers were enthusiastic about participating in both the material delivery sessions and the practical demonstration of silage-making. They recognised that the ensiling process can preserve the nutritional quality of forage, extend its shelf life, and ensure a stable feed reserve throughout the year. Moreover, through interactive discussions, the real challenges faced by farmers in feed provision were identified, and silage technology was perceived as an appropriate strategy to overcome these problems. Overall, this PkM program has successfully improved farmers' knowledge, skills, and motivation in adopting silage-making technology. It is expected that the sustainable application of this technology will contribute to enhancing livestock productivity, improving the efficiency of farming practices, and promoting the welfare of livestock farmer groups in Baroh Village, Montasik District, Aceh Besar Regency.

Recommendations

For Livestock Farmer Groups

It is recommended that farmer groups apply silage-making practices regularly, particularly during periods of forage abundance, to ensure feed reserves for the dry season. Forming small teams within the group dedicated to silage processing and storage will help make activities more organised. The use of local resources and agricultural by-products (such as rice straw, corn stalks, and rice bran) should be optimised to reduce production costs and improve efficiency. Continuous mentoring and technical assistance are also necessary to ensure the sustainability of the skills acquired. Furthermore, support from village policies is encouraged, for instance, through the provision of funding or basic facilities (e.g., choppers, silage plastics, and storage drums).

For Higher Education Institutions (Lecturers and Students)
Universities are expected to continue CS activities with regular monitoring and evaluation of the silage produced by farmers. Applied research collaborations should be established to improve further silage quality, such as through the use of microbial inoculants or natural additives. Students should also be given opportunities to extend this program as part of community service initiatives, especially with livestock farmer groups, as a manifestation of the Tri Dharma of Higher Education. Silage-making activities should be integrated into routine programs targeting farmer groups that have not yet adopted feed preservation technology, particularly to address feed shortages during the dry season when forage availability is reduced. Through the adoption of silage technology, the problem of fresh forage scarcity during prolonged dry seasons can be effectively mitigated.

For Program Sustainability
Further training on more specific topics is necessary, such as silage storage management, calculating feed requirements per head of livestock, and cost analysis of production. Partnerships should also be established between farmer groups and cooperatives or local markets so that silage is not only used for self-sufficiency but can also serve as a marketable product with economic value.

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