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Article

Training on the Production of Cassava Plant Waste Silage as Goat Feed in Penyasawan Village, Kampar Regency

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Silase;
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Desa Penyasawan;
Kabupaten Kampar

Abstrak

Kabupaten Kampar memiliki potensi besar dalam sektor peternakan kambing, namun peternak sering menghadapi kendala keterbatasan pakan berkualitas, terutama pada musim kemarau. Program Pengabdian kepada Masyarakat ini bertujuan untuk meningkatkan pengetahuan dan keterampilan peternak di Desa Penyasawan melalui pelatihan teknologi pengolahan pakan alternatif berupa silase limbah daun singkong. Metode pelaksanaan meliputi identifikasi masalah mitra, sosialisasi, penyuluhan teoretis, serta demonstrasi praktik pembuatan silase secara anaerob selama 21 hari. Hasil kegiatan menunjukkan peningkatan pemahaman peserta sebesar 80,7%, yang tercermin dari kenaikan rata-rata skor *post-test* (82,4) dibandingkan *pre-test* (45,6). Silase yang dihasilkan memenuhi standar kualitas yang baik dengan aroma asam segar, tekstur tidak berlendir, dan kisaran pH 3,8-4,2. Secara ekonomi, penerapan teknologi ini berpotensi menghemat biaya pakan sebesar Rp 450.000 – Rp 600.000 per bulan untuk 10 ekor kambing, sekaligus mendukung sistem peternakan berkelanjutan dan ekonomi sirkular di Tingkat desa.

KEYWORDS

Silage;
Cassava Waste;
Goat Feed;
Penyasawan Village;
Kampar Regency

Abstract

Kampar Regency has great potential in the goat farming sector; however, farmers frequently encounter constraints regarding the limited availability of quality feed, particularly during the dry season. This Community Service Program aims to enhance the knowledge and skills of goat farmers in Penyasawan Village through training on alternative feed processing technology using cassava leaf waste silage. The implementation involved 25 local farmers using a pre-experimental one-gorup pretest-posttest evaluation design. The implementation methods encompass partner problem identification, socialization, theoretical counseling, and practical demonstrations of anaerobic silage-making over a period of 21 days. Participant knowledge was quantitatively measured using a multiple-choice test administered before (pre-test) and after (post-test) the training session. The activity results demonstrated a relative knowledge increase of 80.7% (calculated using the formula [(post-test – pre-test) / pre-test] x 100% from the mean scores), reflected by the rise in the average post-test score to 82.4 compared to the pre-test score of 45.6. The resulting silage met good quality standards, characterized by a fresh acidic aroma, a non-slimy texture, and a pH range of 3.8 to 4.2. Economically, based on a hypothetical calculation derived from replacing 30% of conventional concentrate with cassawa leaf silage (assuming a local concentrate price of IDR 5,000/kg and a daily requirement of 3 kg per 10 goats over a 30-day period), the adoption of this technology has the potential to save feed costs by IDR 450,000 to IDR 600,000 per month for 10 goats, while simultaneously supporting a sustainable farming system and a village-level circular economy.

1. INTRODUCTION

Goat farming is an essential part of the smallholder livestock subsector in Indonesia, particularly in rural areas that implement small- to medium-scale enterprise patterns. In various regions, goats are highly favored due to their relatively easy management, fairly stable market demand for meat and its derivative products, and their ability to utilize local feed around the farming environment. Studies indicate that agricultural waste, including cassava leaf waste and food crop stems, has the potential to be utilized as alternative feed through fermentation technology (silage) to enhance the availability and quality of feed for small ruminants.

Feed processing practices using silage technology have been widely applied in Indonesia as a solution to the limitation of quality feed at the smallholder level. This technology has proven capable of improving the digestibility and nutritional value of local feed to support more optimal livestock productivity (Fitriawaty & Novieta, 2021). Administratively, Kampar Regency in Riau Province possesses significant potential for ruminant development. Feed potential analysis indicates that this region has a livestock population and forage feed sources capable of supporting local livestock businesses, thus presenting vast development opportunities when supported by sustainable and appropriate feed innovations (Novita et al., 2019).

Penyasawan Village in Kampar Regency features extensive agricultural activities that generate various crop residues with the potential to serve as feed raw materials. Specifically, baseline observations in the village indicate a continuous local availability of cassava waste (peels and foliage by-products from small-scale agro-industries and local plantations) estimated at approximately 150–200 kg per week, which is currently discarded or underutilized. Despite this abundant local potential, its utilization remains suboptimal due to limited processing techniques and a lack of farmers' knowledge regarding silage technology. Training and extension activities are crucial to encouraging the adoption of this technology at the village farmer level.

The main problems faced by the goat farmer group in Penyasawan Village include the limitation of quality feed during the dry season, which triggers dependence on expensive commercial feed and hinders livestock growth. Furthermore, farmers do not yet understand the steps of fermentation, raw material handling, mixing

techniques, or methods for assessing the quality of cassava waste silage.

Based on this background, this community service program aims to (1) increase participating farmers' knowledge regarding silage principles by at least 70%, (2) equip participants with practical competence in producing good-quality cassava waste silage independently, and (3) foster a strong intention among farmers to adopt and sustainably apply silage technology in their daily farming practices.

2. METHODS

2.1 Identification of Partner Problems

Problem identification was carried out through an initial survey and direct interviews in Penyasawan Village to obtain primary data regarding the constraints of forage feed supply. A total of 25 goat farmers (comprising 18 males and 7 females) were involved as respondents in this initial needs assessment. The assessment utilized a structured questionnaire focusing on key indicators: daily forage availability across seasons, current feeding practices, local availability of agricultural waste, and prior knowledge of feed technology (fermentation and silage). The collected qualitative and quantitative data were analyzed using descriptive statistics to map out farming constraints and identify community needs.

The identification results indicate several major constraints: forage scarcity during the dry season, minimal knowledge on fermented feed processing using cassava waste despite abundant raw materials, dependency on wild grasses around plantations, and the absence of any systematic silage technology training. These findings served as the basis for designing the training program as well as analyzing the potential utilization of cassava waste.

2.2 Socialization Method

The socialization was conducted prior to the main training to introduce the basic concept of silage and the utilization of cassava waste through several stages:

a) Distribution of informational leaflets containing the definition, benefits, and stages of silage making.
b) Interactive presentations to local livestock groups with the assistance of village officials and agricultural extension workers.
c) Focus Group Discussion (FGD) to identify farmers' expectations and barriers.

2.3 Extension and Practical Demonstration

Kegiatan penyuluhan dan inti pelatihan dilaksanakan di kendang ketua kelompok peternak yang mencakup dua sesi utama:

A. Delivery of Theoretical Material: Covering the concept of feed fermentation (ensiling) for ruminants as well as the characteristics of cassava waste—including nutrient content and methods to reduce antinutritional compounds (cyanide) through proper processing.
B. Silage Making Practical Demonstration: Facilitated by the implementation team with the direct participation of the farmers through the following detailed steps:

a) Material Preparation: The primary material used was chopped cassava leaf waste (10 kg), chopped to a uniform length of 3–5 cm to accelerate the fermentation process and facilitate compaction.
b) Additives and Formulation: Additives were incorporated into the cassava leaves based on a specific wet-weight ratio, consisting of molasses (1% to 2% of total weight or approximately 100–200 mL dissolved in water) to provide readily fermentable carbohydrates, and EM4.
c) Ensiling and Compaction: The mixture was thoroughly homogenized, then tightly packed and compacted layer-by-layer inside heavy-duty plastic silos (drums/bags) to expel trapped air and establish strict anaerobic conditions. The silos were hermetically sealed and stored away from direct sunlight.
d) Monitoring and Evaluation: The fermentation process was maintained for a minimum of 21 days. To ensure accurate monitoring without disrupting the anaerobic environment, **three replicate silos** were prepared. Internal pH was measured destructively at the final opening on day 21 (and intermediate checks were avoided to prevent oxygen contamination) using a calibrated digital pH pen inserted into a core sample extract from each silo. The final silage quality was systematically evaluated based on organoleptic parameters, including color, aroma (characteristic pleasant acidic scent), texture, and acidity degree (pH value).

3. RESULT AND DISCUSSION

3.1 Participant Profile and Implementation of Activities

The training activity was conducted at the Penyasawan Village Hall, Kampar Regency. A total of 25 small-scale goat farmers utilizing a semi-intensive rearing system were recruited through coordination with local farmer groups (inclusion criteria: active farmers raising a minimum of 3–10 goats with an average farming

experience of 3–5 years).

Initial evaluation results indicated that 72% of participants had never produced silage, and 80% were unfamiliar with natural detoxification techniques for cyanogenic compounds in cassava leaves. This condition reflects the low adoption rate of agricultural waste processing technology at the smallholder farmer level, which aligns with reports from the Food and Agriculture Organization of the United Nations (2020).

3.2 Enhancement of Participant Knowledge

Participant understanding was evaluated using pre-test and post-test methods via written questionnaires administered before and after the extension session. Analysis results showed an increase in participants' comprehension scores:

a) Average pre-test score: 45.6 ± 8.3
b) Average post-test score: 82.4 ± 6.7
c) The percentage increase in comprehension (calculated based on the relative improvement from the pre-test to the post-test average using the formula: [(Post-test Score - Pre-test Score) / Pre-test Score] x 100%) was 80.7%.

This score increase indicates that a direct demonstration-based extension method is effective in improving fermented feed technology literacy among the target group. Nevertheless, because this evaluation used a single-group pre-test/post-test design without a control group, the observed improvement cannot be exclusively and absolutely attributed to this single intervention alone. These findings align with Addah et al. (2018), who noted that participatory approaches can boost technology adoption rates among small-scale farmers.

3.3 Practical Results and Silage Quality

Cassava leaf waste silage was fermented for 21 days under anaerobic conditions using plastic silos. Based on organoleptic and chemical evaluations, the following results were obtained:

Color : brownish-green
Aroma : fresh acidic (no foul odor)
Texture : not slimy
Average pH : 3.8 – 4.2

This pH range indicates that the fermentation proceeded optimally, as good-quality silage generally exhibits a pH < 4.5 (Kung et al., 2018). A rapid pH decline suppresses the growth of spoilage bacteria and enhances storage stability.

Based on supporting literature, the ensilage process has proven effective in reducing hydrogen cyanide (HCN) levels in cassava leaves by more than 60% (Li et al., 2019). Although specific laboratory testing regarding HCN residues was not performed on the silage product of this activity, this literature review demonstrates the potential for feed safety in goats provided the anaerobic fermentation process runs perfectly.

3.4 Program Impact on Partners

Based on follow-up evaluations using feedback questionnaires distributed to all participants ($n = 25$) at the end of the activity, the program impact data are as follows:

1. Technical Impact: A total of 68% of participants (17 out of 25 individuals) stated they were ready to produce silage independently, and 52% (13 out of 25 individuals) planned to implement a feed storage system to face the dry season. This adoption has the potential to help maintain a continuous feed supply and reduce production costs by 15–30% in small ruminants (Melesse et al., 2020).
2. Economic Impact: Based on theoretical calculation assumptions (given that actual feed expenditure data before and after the program were not collected directly from the farmers), utilizing cassava waste has the potential to save around IDR 1,500 – IDR 2,000 per head per day in additional forage purchasing costs. When applied to the ownership of 10 goats, the estimated potential savings reach IDR 450,000 – IDR 600,000 per month. This efficiency supports the concept of sustainable livestock production and a local resource-based circular economy (FAO, 2021).

4. CONCLUSION

Based on the implementation of this Community Service program, it can be concluded that:

1. The training program proved effective in improving farmers' knowledge and skills in independently producing cassava leaf waste silage, which was validated by a significant increase from pre-test to post-test scores.

2. Economically, the utilization of cassava waste into silage offers the potential to reduce feed costs and improve the business efficiency of small-scale goat farming based on projected savings, thereby supporting a sustainable livestock production system (*note: longitudinal monitoring of actual farm expenditure post-adoption is recommended for future assessment*).
3. This program makes a tangible contribution to strengthening farmers' capacity through the application of local resource-based feeding technology, which aligns with the concepts of an integrated farming system and circular economy at the village level.

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