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Utilization of Corn Waste for Goat Feed in Brangkal Village, Bandarkedungmulyo, Jombang Regency

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ABSTRACT

Corn, a leading commodity with potential for development in Proko Hamlet, contains agricultural waste that can be used as animal feed. Currently, corn harvest waste is only used as fuel or even disposed of carelessly, leading to environmental pollution. The availability of quality feed ingredients is one of the problems encountered by partners. Therefore, corn cobs, leaves, and husks are used as additives in fermented animal feed. The purpose of this study was to analyze the impact and benefits of corn waste used as raw material for goat feed. The method used consisted of three stages: observation surveys, interviews, and training on corn waste processing. The results of this study indicate that corn waste can be processed into raw material for animal feed and organic fertilizer. This processing has the potential to reduce environmental pollution caused by agricultural waste. In addition, utilizing this waste can also increase agricultural productivity. Furthermore, this activity also encourages increased awareness and participation of the community, particularly farmer groups in Proko Hamlet, in sustainable waste management. Based on the results of interviews with several respondents, it was discovered that processing corn waste as raw material for animal feed has the potential to be an alternative to quality fermented feed. In addition, this approach is considered sustainable and environmentally friendly, thus supporting efforts to manage agricultural waste more efficiently and responsibly.
***Keywords**: Waste; Corn Straw; Animal Feed.*

INTRODUCTION

Proko Hamlet is a hamlet located in Brangkal Village, Bandarkedungmulyo District, Jombang Regency. Most residents of Proko Hamlet work in agriculture, trade, and animal husbandry. Farming and animal husbandry in this hamlet are small-scale and carried out by household members to support family needs. One agricultural product is corn. Corn is a strategic agricultural commodity that is easy to cultivate, making it the primary food source for carbohydrates and protein after rice. It is also a raw material for industry (Rasyid et al., 2022).

Generally, the corn kernels are utilized. Other parts of the corn plant, such as straw, cobs, corn cobs, and corn husks, constitute a significant amount, accounting for 20-30% of 100 kg of corn, and are considered corn waste (Suretno et al., 2021). However, corn production also generates waste that can cause environmental problems if not managed properly.

Corn is a multifunctional plant, including stalks, leaves, and corn cobs that can be processed into animal feed, because these parts are rich in crude fiber that is good for animals. This waste is generally considered a production waste that has no economic value. As a result, corn waste is often ignored or simply thrown away, resulting in a negative impact on the environment. However, with increasing awareness of the importance of managing corn waste as raw material for organic fertilizer, it can provide dual benefits: reducing environmental pollution and producing organic fertilizer useful in agriculture. When viewed from raw materials, fertilizers are divided into organic and inorganic fertilizers. Organic fertilizers are fertilizers derived from plant remains or animal waste, which can be in the form of green manure, manure, liquid or solid compost. Inorganic fertilizers are fertilizers made from chemicals, such as urea, ZA, TSP, SP36, and KCl (Ginting, 2015h). Organic fertilizers have various advantages over chemical fertilizers. Organic fertilizers can improve soil quality, improve soil structure, increase nutrient availability, and reduce the risk of water pollution (Tawfik, A., Hammad, S., & El-Masry, M. 2018).

Goat farming serves as a side business to meet the additional needs of the Proko Hamlet community. Only 30% of the population in the area raises cattle, while the remaining 70% raise goats. A common complaint is the uncertain supply of livestock feed. While livestock feed is readily available during the rainy season, the situation is different during the dry season, as forage sources such as grass and leaves cannot be utilized due to drying. One solution is to utilize corn harvest waste as a source of livestock feed. Corn husks, leaves, and corn cobs are typically burned to prepare the land for the next planting. The lack of additional processing of corn waste as a livestock feed ingredient results in low crude fiber content and low digestibility.

The direct use of corn waste as a sole feed cannot meet the nutritional needs of livestock. To utilize abundant waste, efforts are needed to increase its utility through appropriate feed technology. One appropriate feed technology used in processing animal feed ingredients is biotechnology through fermentation (Afandi, 2014). Fermentation is a feed preservation process by providing microorganisms as anaerobic starters (active ingredient microbes / E4) (Khasanah et al., 2020; Winarno, et al., 1998). Bacteria frequently used in the fermentation process are Actinomycetes, Pseudomonas, Lactobacillus, Trichoderma, Acetobacter, and Rhizobium, which can accelerate and improve the fermentation process (Prasetyo et al., 2022; Suherman et al., 2023).

This certainly presents a significant potential for meeting livestock feed needs if corn crop waste, such as corn cobs, stalks, leaves, and husks, are processed into silage through fermentation. Therefore, the livestock feed production process utilizes appropriate technology, including silage production using corn crop waste and the availability of feed shredding equipment. This will ensure farmers are not experiencing feed shortages during the dry season.

In the context of corn waste processing, its use as a raw material for organic fertilizer will also provide added economic value for farmers and the fertilizer industry. By processing corn waste into organic fertilizer, resources previously considered waste can be utilized and transformed into valuable products. Furthermore, corn waste processing can also help reduce the use of chemical fertilizers that have the potential to harm the environment and human health. This demonstrates the importance of processing corn waste into raw material for organic fertilizer in the context of sustainable development and the sustainability of the agricultural sector. By reducing waste and utilizing it effectively, we can minimize the negative impacts of corn production while simultaneously making a positive contribution to the environment and sustainable agriculture.

The positive impact of utilizing corn waste is reducing pollution in river irrigation channels, rice fields, around planting areas; reducing air pollution. And the negative impact is that it always becomes waste in river irrigation channels/rice fields, if burned it takes a long time and must wait until it dries, if burned on land it will become waste in the planting area if it is really not clean. By utilizing corn waste is one of the efforts made by the community to maximize the use of existing resources so that it can help the household economy and can create a clean and environmentally friendly environment.

RESEARCH METHODS

The research was conducted on the utilization of corn waste using the silage method for goat feed. The raw materials from corn waste used were corn cobs, leaves, and corn husks. Observations were conducted to determine the real conditions in the field regarding agricultural commodities that have the potential to produce corn waste. Then, what have farmers done to overcome corn waste processing. In addition, observations were also made about the condition of livestock feed generally provided by farmers.

1. Research Approach

   This research uses qualitative methods. This is because the research focuses on a deep understanding of the phenomenon, rather than on numbers or measurements. Qualitative data analysis involves processes such as data reduction, data presentation, and drawing conclusions. Therefore, the researcher went directly into the field to explore the research object. The focus was on objectives regarding the cost and benefit values, as well as the influencing factors of corn waste.

2. Types and Sources of Data
   a. Data Type

This research uses descriptive data. Descriptive data is data collected in the form of words and images rather than numbers. Qualitative data is obtained through various data collection techniques, including observation and interviews, asking questions both verbally and in writing. Another form of qualitative data is images obtained through photography, which can be used as documentation.

b. Data Sources

The data sources referred to in this study are all information obtained from informants based on interviews. The primary data source in qualitative research is interviews, consisting of words and actions, with the remainder being supplementary data such as other documents. The author used interview techniques in data collection, which are divided into two categories: primary data and secondary data.

First, primary data sources are data obtained directly from goat breeders and farmer groups as sources or informants. Interviews were conducted using interview guidelines and prior observations.

Second, secondary data sources are data collected from various existing sources, such as books, journals, previous research results, reports, and other sources related to the author's research title.

3. Location and Time of Research

a. Research Location

The research location is in Proko Hamlet, Brangkal Village, Bandarkedungmulyo District, Jombang Regency. The researchers chose this location because the local population is predominantly goat breeders and farmers, providing them with a good understanding of the conditions of the farming groups in the area.

b. Research Time

This research activity was carried out in July 2025. The informant data sources were obtained through in-depth interviews and observations.

4. Data Collection Techniques

The data collection techniques used in this research are as follows:

a. Observation

Conducting observations or surveys to determine the condition of the livestock farming group in Proko Hamlet. Observations involve direct observation of the phenomena or behaviors being studied. Researchers directly observe situations, behaviors, or events relevant to the research. Observations are conducted openly (the researcher and participants schedule observation visits).

b. Interview

Interviews allow researchers to gain in-depth understanding through direct interaction with informants. Researchers interact directly with informants to dig deeper into their experiences, perceptions, and views regarding the use of corn waste for goat feed, using unstructured (informal) and semi-structured (with question guide) interviews. In this step, researchers prepare a list of questions and a plan for recording the activities of the research objects, where the informants that researchers will interview include: interviews with the head of the farmer and livestock group, interviews with several goat livestock members, interviews with the owner of the livestock feed home industry. From the results of the interviews conducted, it was possible to identify the problems faced by the livestock farmer group in Proko Hamlet. The problems faced by the livestock farmer group are fulfilling livestock feed during the dry season, disease control in livestock, in terms of marketing.

c. Feed Processing Training

Processing training, namely conducting training activities related to the processing of silage milling from corn waste into more efficient and environmentally friendly animal feed and organic fertilizer. This can involve collaboration between researchers, industry, livestock breeders, and farmers to create innovative solutions in corn waste processing. This activity begins with the preparation of corn plant waste, namely corn cobs, stalks, leaves, and husks as the main ingredients, followed by the preparation of additional materials and tools that will be used in making the silage. The purpose of this animal feed production is to understand animal feed fermentation so that you can make it yourself to meet livestock feed needs.

d. Documentation

Documentation refers to the collection of data from various relevant written, pictorial, or recorded sources.

5. Data Analysis Techniques
   a. Data Reduction

      To maximize data reduction, it is advisable to determine the focus of the research in the sense of focusing on important things, selecting the main things and then summarizing all the data obtained. The focus of this research is the use of corn waste as goat feed in Proko Hamlet. Researchers examine that corn waste is very useful as goat feed during the dry season if the waste is processed through a fermentation process into silage. However, if this waste is not used properly, it can cause environmental pollution because it is burned.

   b. Presentation of Data

      Data presentation is a collection of structured information that allows for drawing conclusions and taking action. In this step, researchers attempt to organize relevant data so that the information obtained can be summarized and meaningfully addressed in the research problem. Utilizing corn waste as a nutritious alternative animal feed has positive outcomes, both economically and environmentally, as well as in terms of animal health.

6. Use of Tools and Materials

   The materials used from corn waste are E4, molasses, rice bran, and minerals. Next, these ingredients are thoroughly mixed and placed in a drum or thick plastic bag, designed to prevent leaks. The fermentation period is approximately 12 hours, until the desired consistency is reached, at which point it is considered ready to be used as animal feed.

   The tools used to grind waste materials can be of two types, namely manual and non-manual:

   a. Manual tools, namely those used daily by farmers, include knives, sickles, machetes, or tools commonly used for cutting tobacco.
   b. Non-manual tools, namely milling machines that are factory-assembled or manually assembled in various capacities/sizes for different functions.

RESULTS AND DISCUSSION

From the results of observations, it turns out that corn waste can be used for various things that can help the household economy, such as for goat feed, corn waste can also be used for other purposes that can generate economic or even fuel, but it turns out that corn cob waste and other waste have a myriad of benefits that have been well proven, and show many compounds that can function as animal feed ingredients to maintain health (corn waste).

Result

The use of corn waste as an alternative nutritious animal feed has various positive results, both in terms of economics, the environment, and animal health, namely:

1. Increased crude fiber content in corn waste feed, such as corn stalks, cobs, husks, and leaves, which only provide satiety for livestock and provide no protein at all if not processed through fermentation/silage.
2. Reduced Feed Costs
   Using corn waste can reduce dependence on more expensive commercial feed. Farmers can process their own corn waste-based feed, thereby reducing production costs.
3. Environmentally Friendly and Supports a Circular Economy
   Utilizing corn waste reduces agricultural waste that can pollute the environment. The circular economy model is implemented by converting waste into economically valuable products.
4. Positive Impact on Livestock Growth
   Corn waste-based feed can increase goat growth with competitive yields compared to conventional feed. Digestibility and livestock productivity increase if corn waste is formulated with other additives such as molasses and rice bran.
5. Entrepreneurship Opportunities for Livestock Farmers and Breeders
   a. Corn farmers can sell corn waste as a raw material for fermented feed, creating new business opportunities.
   b. Farmers can develop alternative feed production businesses based on agricultural waste.

Farmers and livestock breeders are interconnected in food security. Selling corn waste to livestock breeders can increase their yields, from the usual 70% to 80%. For livestock breeders, the advantage is that it makes it easier to source staple foods.

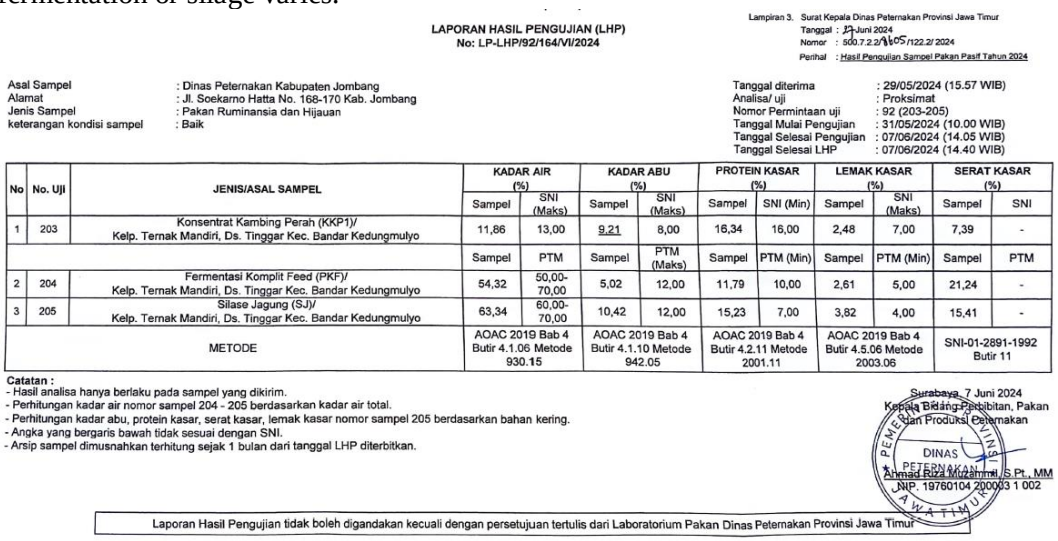
In this study, the author will present data from several sources that the author interviewed from the head and members of the farmer group as well as goat breeders.

Table 1. Data from Sources Interviewed by Researchers

No	Name	Age	Gender	Last Education	Length of Goat Farming	Profession
1.	Syihabuddin	62	Man	Senior High School	15 Years	Farmer Group Leader
2.	Imam Khudhori	53	Man	Senior High School	10 Years	Members of Farmer Groups
3.	Ilham	45	Man	Senior High School	6 Years	Members of Farmer Groups

Discussion

Corn production in Proko Hamlet fluctuates, with an average annual production of 970,960 t/ha, with a growth rate of 9.60%. Influencing factors include production levels, productivity, and harvested area. The growth rate of corn productivity is 14.10%, which is not in line with the increase in harvested area, which continues to decline, with a growth rate of -4.50%. Furthermore, internal factors significantly influence corn production, including the continued use of local seeds and the limited use of quality seeds due to the high price of seeds at the farmer level (Subandi, 2005). The nutritional content of corn waste that has undergone fermentation or silage varies.



LAPORAN HASIL PENGUJIAN (LHP)
No: LP-LHP/92/164/VI/2024

Lampiran 3. Surat Kepala Dinas Peternakan Provinsi Jawa Timur
Tanggal : 17 Juni 2024
Nomor : 500.7.2.2/4605/122.2/2024
Perihal : Hasil Pengujian Sampel Pakan Pasif Tahun 2024

Asal Sampel : Dinas Peternakan Kabupaten Jombang
Alamat : Jl. Soekarno Hatta No. 168-170 Kab. Jombang
Jenis Sampel : Pakan Ruminansia dan Hijauan
keterangan kondisi sampel : Baik

Tanggal diterima : 29/05/2024 (15.57 WIB)
Analisa/ uji : Proksimat
Nomor Permintaan uji : 92 (203-205)
Tanggal Mulai Pengujian : 31/05/2024 (10.00 WIB)
Tanggal Selesai Pengujian : 07/06/2024 (14.05 WIB)
Tanggal Selesai LHP : 07/06/2024 (14.40 WIB)

No	No. Uji	JENIS/ASAL SAMPEL	KADAR AIR (%)		KADAR ABU (%)		PROTEIN KASAR (%)		LEMAK KASAR (%)		SERAT KASAR (%)	
			Sampel	SNI (Maks)	Sampel	SNI (Maks)	Sampel	SNI (Min)	Sampel	SNI (Maks)	Sampel	SNI
1	203	Konsentrat Kambing Perah (KKP1)/ Kelp. Ternak Mandiri, Ds. Tinggar Kec. Bandar Kedungmulyo	11,86	13,00	9,21	8,00	16,34	16,00	2,48	7,00	7,39	-
			Sampel	PTM	Sampel	PTM (Maks)	Sampel	PTM (Min)	Sampel	PTM (Min)	Sampel	PTM
2	204	Fermentasi Komplit Feed (PKF)/ Kelp. Ternak Mandiri, Ds. Tinggar Kec. Bandar Kedungmulyo	54,32	50,00-70,00	5,02	12,00	11,79	10,00	2,61	5,00	21,24	-
3	205	Silase Jagung (SJ)/ Kelp. Ternak Mandiri, Ds. Tinggar Kec. Bandar Kedungmulyo	63,34	60,00-70,00	10,42	12,00	15,23	7,00	3,82	4,00	15,41	-
METODE			AOAC 2019 Bab 4 Butir 4.1.06 Metode 930.15		AOAC 2019 Bab 4 Butir 4.1.10 Metode 942.05		AOAC 2019 Bab 4 Butir 4.2.11 Metode 2001.11		AOAC 2019 Bab 4 Butir 4.5.06 Metode 2003.06		SNI-01-2891-1992 Butir 11	

Catatan :
- Hasil analisa hanya berlaku pada sampel yang dikirim.
- Perhitungan kadar air nomor sampel 204 - 205 berdasarkan kadar air total.
- Perhitungan kadar abu, protein kasar, serat kasar, lemak kasar nomor sampel 205 berdasarkan bahan kering.
- Angka yang bergaris bawah tidak sesuai dengan SNI.
- Arsip sampel dimusnahkan terhitung sejak 1 bulan dari tanggal LHP diterbitkan.

Surabaya, 7 Juni 2024
Kepala Bidang Perbibitan, Pakan dan Produksi Peternakan

DINAS PETERNAKAN

Ahmad Riza Muzammil, S.Pt., MM
NIP. 19760104 200003 1 002

Laporan Hasil Pengujian tidak boleh digandakan kecuali dengan persetujuan tertulis dari Laboratorium Pakan Dinas Peternakan Provinsi Jawa Timur

Figure 1. Passive Feed Sample Laboratory Testing Results Report 2024

The results of dairy goat concentrate samples indicate that it can supplement deficient forage nutrition, increase milk production and livestock profits, and help maximize rumen digestion by increasing microbial activity.

Complete fermented feed provides a complete nutritional mix of forage, concentrate, and supplements formulated to meet livestock nutritional needs in a balanced manner, enabling optimal growth without the need for additional feed. It also minimizes leftover feed and rumen microbial fluctuations. This results in balanced nutrition for livestock, improving livestock performance, feeding efficiency, rumen stabilization, and flexibility.

Corn silage is a fermented livestock feed made from corn crop waste such as shredded leaves and stalks. It is stored in an airtight plastic bag or silo for preservation, providing a feed reserve during the dry season or when fresh feed is limited.

Below are several stages in the process of processing corn waste as animal feed.

Figure 2. Diesel Engine

The diesel tractor or water pump engine in Figure 1 was assembled or modified by a farmer to use as a feed grinder. This 6-horsepower engine uses 12 blades measuring 25 cm long and 2 cm wide. It uses diesel fuel.

Figure 3. Feed Milling Process

The process of grinding corn stalks and leaves using a feed grinder to make them more digestible for livestock. A single grinding process can achieve maximum results, making them easily digestible for livestock.

Figure 4. Storage and Drug Addition Stages

Waste that has gone through the milling stage is then mixed with additional materials such as molasses, bran, minerals, which is carried out simultaneously with packaging in plastic until it is solid and no gaps or empty spaces are allowed.

Figure 5. Storage of Results

Corn waste that has gone through several stages and is ready for storage. The storage process takes two days, and it should be kept in a dry place and out of direct sunlight.

Figure 6. Application of Corn Waste Silage Results for Animal Feed

The silage feed results from corn waste that has been cooked or has gone through a storage process can be given directly to livestock without being mixed with other ingredients.

Figure 7. Application of Animal Feed for Goats with the Head of the Farmer Group

The author is currently applying animal feed and interviewing the head of a farmer's group. The corn waste has undergone several refining processes, making it ready to be fed to goats.

CONCLUSIONS

Utilizing corn waste as an alternative animal feed is an innovative solution to support sustainable agriculture and livestock, particularly for ruminant (goat) farmers, as it can ensure feed availability during the dry season. With proper processing, corn waste becomes a valuable source of nutrition for livestock, reducing agricultural waste, and increasing farm efficiency and profitability. Through silage production, corn waste used as forage undergoes macrocomponent breakdown into simpler microcomponents, making it easily digestible by rumen microbes and increasing digestibility. In the silage processing process, it is possible to add other ingredients, namely substances that function to help the smooth process of ensilage, in supplying nutrients for lactic acid bacteria, to produce lactic acid enzymes or microbes can increase the availability of nutrients needed by lactic acid-forming bacteria. The green fodder obtained comes from corn plant waste. Corn straw is chopped using a chopping machine to get smaller chopped results with the same size. The silage making process takes 1-2 weeks, then the silage is stored as a reserve of animal feed for the dry season in tightly closed conditions (anaerobic). The purpose of making silage is to utilize corn plant waste as green fodder for animal feed when corn production is abundant so that the waste can be preserved and used when green fodder production is low (dry season). Additional materials added are approximately 0.5% of the weight of the green fodder to be processed. The chopped green fodder is arranged in a silo made of plastic barrels specially designed as a silo. The process of stacking green fodder in the silo must be completely dense so that no air is retained between the piles. After 2 weeks of anaerobic incubation, the silage has shown maturity with the following characteristics: brownish green color, fresh sour aroma, solid texture, not soft and not slimy, and pH 4.3.

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