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Dissemination and Transfer of Animal Feed Technology in Kupang Timur Subdistrict, Kupang Regency

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Abstract

Kupang Timur Subdistrict has high potential for livestock farming, especially with its large cattle population. Recorded by BPS in 2014, the population of large livestock animals especially beef cattle amounted to 14,077 heads. However, during the dry season, there is often a shortage of feed due to limited knowledge and technology among farmers. To overcome this problem, Brawijaya University through the program of Matching Fund program by Kedaireka in collaboration with Nusa Cendana University and the Department of Agriculture and Food Security of East Nusa Tenggara Province. Department of Agriculture and Food Security of East Nusa Tenggara Province provided training on animal feed technology through lectures, material on animal feed technology through lectures, written materials, and demonstrations.This program includes dissemination and transfer of technology, as well as provision of agricultural equipment to farmers. The program aims to continue until the end of November, with the goal to leveling up the knowledge of local farmers. Sustainability will continue to be encouraged by assisting potential farmers and agricultural extension officers as supervisors of the sustainability of the innovations that have been provided.

Keywords: *Silage, Feed, EM4 5*

INTRODUCTION

East Kupang Subdistrict is located in Kupang Regency in East Nusa Tenggara Province. Based on BPS data in 2014, the number of cattle reached 14,077 heads, while buffalo livestock increased from 145 heads in 2013 to 208 heads in 2014.

The level of livestock productivity in an area depends on the availability of feed in the area, so feed is one of the main factors in supporting livestock productivity. Feed availability in dryland areas such as East Kupang Sub-district fluctuates with seasonal changes. Dufeering the long dry season, there is a real problem faced by farmers, they are the quality and quantity of animal feed. This is also experienced by farmers in East Kupang Sub-district, especially in the farmer groups Sama Rasa, Maju Bersama, and KWT Teode. During the long dry season, farmers prefer to release their animals to find their own feed.

As an alternative solution, the amount of feed can be met by utilizing excess feed in the rainy season using the silage method. Silage is a technique of storing feed in a container called a silo and closed tightly and airtight and stored for a long time. Silage is usually used as a feed reserve during extreme weather or in areas that have abundant feed availability, so good feed storage is needed to maintain feed quality.

Silage can be divided into 2 types, namely single silage and complete silage. Single silage uses only one type of forage, while complete silage uses additional feed ingredients to increase the nutrient value of the silage made. Complete silage has advantages such as easy making because it does not require anaerobic fermentation (semi-aerobic is sufficient), higher nutrient content (can meet the nutrient needs of cattle up to 90%), and physical properties that are preferred by cattle.

The ingredients used in making complete silage consist of 3 groups, namely forage, concentrates, and additives. Concentrate for cattle feed is needed by ruminants, especially our cattle for fattening, because the concentrate material is very easy to ferment so that the concentrate will

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increase the propionate content which is very useful in meat formation, and will stimulate and increase the amount of rumen microbial growth, so that the source of crude fiber feed will be digested more quickly.

By adding concentrate to the feed consumed by livestock, the nutritional value is improved, and it is more easily consumed by livestock. In addition, various organisms in the rumen can use the concentrate first as energy. Then use feed as a source of crude fiber such as grass or hay that is available (Utomo et. al., 2013). Concentrates are very easy to digest and serve as the main feed substance such as carbohydrates and protein.

Forage or straw feed is generally given after two hours of concentrate feeding, this is done so that microbes can multiply first, so that cows can digest forage or straw feed properly. The ratio between forage and concentrate to achieve the highest feed efficiency is 60%: 40%. Therefore, concentrates for cattle feed are very important in beef cattle breeding, and for other livestock.

Forage is used as a source of fiber for livestock. Concentrates are added in the silage making process to improve the nutrient value of the silage made. additives in making complete silage are obtained from the addition of urea and molasses. The ratio of the three groups of feed ingredients for forage, concentrate and additives is 7:2:1 or 6:3:1, respectively (Dianingtyas et. al., 2023). Farmers can make silage feed independently by mixing forage feed such as leaves or grasses, etawa goat concentrates such as bran, as well as molasses (sugar liquid / sugar cane drop), and or probiotic liquid.

Silage will be of good quality if during fermentation it is dominated by lactic acid bacteria, while the activity of Clostridia bacteria is low. Silage will be good if it can condition airtightness through compaction of silage material as much as possible and the addition of fermentable carbohydrate sources(Naif et. al.,2016(. Methods to suppress the presence of oxygen can be done by sanding using CO2 gas, conventional compaction or divacum is proven to help the fermentation process (ensilage). The use of mollases additives proved to be able to produce silage with an incubation period of 21 days more effective in reducing pH to 4.2 than lactic acid bacteria additives (Nahak et. al., 2019). The use of EM4 and additives Blimbing wuluh, Mollases and rice bran each as much as 3% proved to produce good physical quality of mini elephant grass silage. The use of additives can be in the form of fermentable carbohydrate sources such as mollases and rice bran to achieve anaerobic conditions in the silo(Marawali et. al., 2022). If anaerobic conditions are not achieved, it can cause the development of Clostridia bacteria, mold and a decrease in nutritional content.

Corn is the leading crop product in Kecamatan Kupang Timur. Based on data from BPS Kecamatan Kupang Timur in 2014, corn production in this sub-district reached more than 2847 tons. The abundant corn production has led to an increase in animal feed made from corn harvest waste. All parts of corn waste, including stems, cobs and leaves, can be utilized as cattle feed.

Based on the description above, by utilizing corn waste for making animal feed using the silage method. So in the Matching Fund program collaboration between Brawijaya University, Nusa Cendana University, and the Department of Agriculture and Food Security of NTT Province, animal feed technology dissemination was held. This transfer of knowledge and technology is also carried out with full assistance so that farmers can understand and be independent in meeting feed needs to increase livestock productivity.

MATERIAL AND METHOD

This activity is divided into 2 parts, namely training and mentoring. Training on making complete silage, single silage, and EM4 was conducted at the BPP Naibonat Office in East Kupang District, the first training was held on August 23 and 24 2023 and the second training was held in the fourth week of October 2023. Farmer/farmer mentoring was conducted from August 22 to the fourth week of November 2023 at the residence of farmer group representatives.

The method used in this activity is the participatory action research method. 30 farmers/farmers and the implementation team with the help of students were jointly involved in training activities to make complete silage, single silage, and EM4. The stages of activities in overcoming partner problems are: (1) Preparation. The intended preparation is that the implementation team and partners determine the right schedule and time for the implementation of activities and assistance so that they can answer and overcome the problems that have been designed in the initial discussion; (2) Training and making complete silage, single silage, and EM4.

Training and mentoring by the implementing team as well as direct practice by farmers / breeders with the aim of increasing partner knowledge and understanding; and (3) Organoleptic and palatability testing of silage quality.

The materials and tools used in this service are as follows:

a. Materials per 100 kg of complete silage:
   1. Concentrate
      1.1 Ground corn 15 kg
      1.2 Rice bran 15 kg
   2. Forage
      2.1 Corn straw 30 kg
      2.2 Lamtoro 15 kg
      2.3 Gamal 15 kg
   3. Additives
      3.1 EM4 4 kg
      3.2 Sugarcane Drops/Mollasses 3kg
      3.3 Dolomite 2kg
      3.4 Urea 1 kg

b. Single Silage Material
   1. Forage (corn stover, gamal, etc.)
   2. Additive (EM4/Mollase)

c. 20 liter EM4 propagation material
   1. Toge 200 grams
   2. Mineral 1 pack
   3. EM4 2 liters
   4. 18 liters of water
   5. Liquid sugar 1 liter
   llase)

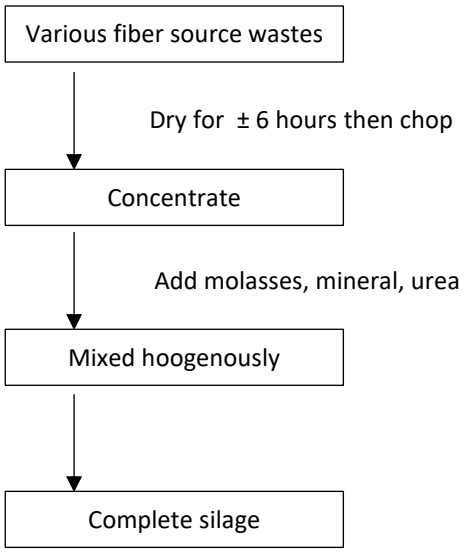
d. Tools
   1. Chopper Machine
   2 Hoe
   3. Buckets
   4. Filters
   5. Machete
   6. Plant watering tool
   7. Drums
   8. Plastics
   9. Tarps

RESULT AND DISCUSSION

Based on the training activities carried out at the BPP Naibonat Office, East Kupang District, the results and discussion of the activities carried out are as follows.

1. Silage Making Stage

Generally, complete silage is made like other single-ingredient silages, the difference lies in the use of more complete ingredients and additives. The forage used in making this complete silage consists of corn stover, legumes such as forage gamal (Gliricidia sepium), lamtoro (Leucaena leucocephala), then concentrates in the form of rice bran and corn flour, and additives in the form of mollase, dolomite, urea, and EM4. The use of legumes and grasses is based on their abundant availability during the rainy season.



Figures 1. *Flow chart of making complete silage*

The manufacturing process is that the forage is weathered first for ± 6 hours to reduce the water content. Forage moisture content needs to be reduced so that the fermentation process can run normally and the risk of spoilage due to too high water content can be prevented. After the moisture content of the material is reduced, it is continued with chopping using a chopping machine (Figure 2). The results of the chopping are weighed and mixed evenly. Then weigh the concentrate in the form of rice bran and corn flour in a ratio of 15:15 and sprinkle on the mixed forage. The mixture is then stirred evenly until homogeneous. Then add additives such as EM4, molasses, dolomite, and urea in the ratio of 4:3:2:1 and stir until homogeneous (Figure 3). Next, the mixture is put into the silo (plastic drum with a capacity of 150 kg) slowly while pressing with the aim of removing the air in the silo (Figure 3). Once fully loaded the silo was closed and stored for 21 days (Figure 3). Silage storage is not exposed to the sun directly so it is recommended to be stored in the shade. The silage fermentation process takes at least 21 days to achieve optimal results [3]. Afterward, the silo was opened, and organoleptic and palatability tests were conducted on the livestock.

Figure 2. *Chopping process*

Figure 3. *Addition of additives and closing silo*

The process of making single silage is exactly the same as the process of making complete silage, the only difference is the ingredients used.

2. EM4 Multiplication

Figure 4. *Demonstrate of EM4 Multiplication*

In multiplying EM4 broodstock, the first process is to prepare tools and materials in a sterile state. Blend the cleaned toge, plus minerals, and liquid sugar. Then bring the blended ingredients to a boil. After boiling, stir and strain the material and then put it in a container. Let the ingredients stand for 1 night, after which EM4 is added.
The benefits/uses of EM4 which is processed by yourself are as plant nutrition besides that it can function as a decomposer of cow and chicken manure (accelerating the reaction), and ingredients to eliminate odors in restaurants and septic tanks. For plants, it functions for mixing organic matter with the use of soil (Hilakore et. al., 2022).

3. Organoleptic Quality of Silage

One method of assessing the quality of silage can be observed organoleptically such as color, aroma, texture, and the presence of fungi. The cause of failure in making silage can be influenced by several factors such as the wrong manufacturing process, anaerobic conditions that are not created, and the lack of availability of soluble carbohydrates (Naif et. al., 2016).
From the organoleptic, it illustrates that the ensilage (fermentation) process runs optimally. These results are supported by various literature that quality silage has a natural green or yellowish green color (Cristi et. al., 2018) Changes in color in silage during the fermentation process occur the release of oxygen so that the sugar in the plant will be oxidized and cause the temperature to rise so that the color will change.

Figure 5. *Silages after 21 days of fermentation*

Figure 5 explains that the silage produced is classified as quality with color, texture, aroma and not overgrown with decay fungi that are in accordance with quality silage.
The aroma of silage produced in the service activities is also included in the category of quality silage because it produces a distinctive aroma of silage, namely sour aroma. The sour aroma produced comes from lactic acid bacteria formed during the fermentation process. To spur the growth and performance of lactic acid bacteria, a source of soluble carbohydrates is needed and in this service activity, the soluble carbohydrate sources used are rice bran and corn flour. The resulting silage has a solid texture and is categorized as quality silage (Tahuk et. al., 2020). The texture of silage will become mushy and not clumpy if there is air in the silo and the moisture content in the forage is still high. The same thing at the level of the presence of fungi, where the results did not show the presence of fungi growing on complete silage. Generally, the growth of mold can be caused by the presence of oxygen in the silo. The presence of oxygen is caused by the level of density of the material in the silo which still leaves the room and the type of silo used. (Despal, et. al., 2017). States that to avoid spoilage bacteria in silage, additional additives are needed that will stimulate the growth of lactic acid bacteria. From

this organoleptic aspect, it explains that the silage making process takes place normally.

Silage is a fairly simple feed technology that can be utilized during feed shortages. Excess forage in the rainy season can be preserved and used in the dry season. One thing that greatly affects complete silage is the use of silos. The silo used in this activity is a plastic drum with a capacity of 150 kg. The use of this drum is quite easy for farmer group members so that it can be moved to the desired place. The existence of this activity also helped the farmer groups involved, namely Sama Rasa, Maju Bersama, and KWT Teode, so that livestock productivity could be maximized. The added value for farmer groups is that the activities carried out by the service team provide positive value for farmer groups, where before the animal feed training activities, the related farmer groups were at the beginner class level for farmer groups but after the activities took place they changed to the advanced class.

4. Palability

Figure 6. *Palability test*

Palatability is the level of preference shown by livestock to consume a given feed ingredient within a certain period (Tahuk, et. al., 2020). Palatability describes the level of livestock preference for complete silage and single silage made. Harvested silage (21 days), silos were opened and aerated to reduce the sour aroma of silage. It was then fed to livestock belonging to members of the Sama Rasa, Maju Bersama, and KWT Teode farmer groups. Direct application to livestock owned by farmers is expected to provide morale for farmer groups to continue making silage. Based on the palatability test (Figure 6), it is clear that most cattle require habituation to silage feeding for the first time. This is influenced by several factors including poor appetite, unfamiliar smell and taste of silage for cows. In order to increase the cows' appetite, the cows were fed in the afternoon for palatability testing in the morning of the following day. This proved to have an effect, where the cow's appetite increased which caused the cow to eat the silage without rejecting it, and this explained that the palability of the silage was quite high.

Palatability is more influenced by the appearance of the feed itself. Appearance is based on the texture, color, shape of the feed, aroma, taste and temperature. Judging from the organoleptic silage made, it will also increase palatability. The dense texture, sour aroma and yellowish green color of the silage made stimulates livestock to consume it.

IMPACT OF ACTIVITIES

Through this dissemination and technology transfer, maize harvest waste as well as wild forage that is abundant at certain times has the potential to be utilized as animal feed. Farmers have understood that harvest waste can not only be used as soil fertilizer but can be used for silage material which can then be used as animal feed or commercialized to increase income. The donated tools and materials for making animal feed such as choppers can be utilized for various needs, so that the community can enjoy the impact of dissemination and technology transfer that has been carried out for future sustainability.

CONCLUSION

Based on the activities that have been carried out, it can be concluded that the making of silage and EM4 carried out by the service team can take place well and produce complete silage and single silage and quality EM4, characterized by high organoleptic and palatability. The existence of this activity also makes the farmer group upgrade or rank from the beginner class to the advanced class. It is the great hope of the Sama Rasa, Maju Bersama, and KWT Teode farmer groups that mentoring continues to be carried out by the service team so that farmer groups become a forum for farmers / livestock farmers who are independent and able to remain active in improving the family economy through agriculture / livestock.

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