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DEVELOPMENT OF ALTERNATIVE FEED BASED ON SILAGE METHODS AND UTILIZATION OF GOAT MANURE AS ORGANIC FERTILIZER USING SIMPLE PROCESSING METHODS IN THE KUBE SEJAHTERA X BINANGUN 005 FARMER GROUP, SIDOHARJO VILLAGE, SAMIGALUH SUB-DISTRICT, KULON PROGO DISTRICT

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ABSTRACT

The COVID-19 pandemic and the emergence of Foot and Mouth Disease (FMD) outbreaks have weakened the economy, including the goat farming subsector. The decrease in demand for goats in the livestock market is the most dominant impact. Presently, farmers are no longer thinking about profits but how to maintain their farms. Transferring knowledge about alternative feed by utilizing local resources and processing organic fertilizer from goat manure is one strategy to reduce maintenance costs and increase the selling value of goat manure with the optimism of becoming an additional source of income for farmer groups. The development of alternative feed using the silage method and goat manure processing is carried out with simple fermentation-based processing. Community service has been carried out with a counselling method accompanied by interactive discussions followed by self-practice with assistance. Evaluation of community service activities has been carried out by looking at and assessing the physical standard parameters of the products produced by farmers, consisting of the quality of silage and organic fertilizer. The results of this community service, member farmers from the KUBE

Sejahtera X Binangun 005 farmer group were able to understand and successfully improve their skills in making alternative feed based on local resources using the silage method and making organic fertilizer with the main ingredient of goat manure.

Keywords: fermentation, Bligon goat, PE goat, partner, community service, farm

INTRODUCTION

The COVID-19 pandemic and the outbreak of Foot and Mouth Disease (FMD) in ruminants have disrupted the growth of livestock, and the occurrence was also experienced by livestock on farms in the KUBE Sejahtera X Binangun 005 farmer group. At the beginning of the pandemic, because the necessities of life tended to increase while work activities outside the home were limited, livestock sales at low prices often occurred. Likewise, during an FMD outbreak, selling livestock at low prices is a logical thing for breeders to do because of various fears about the risk of this disease. However, after time passed, selling goats at low prices was no longer carried out due to the impact of losses felt by breeders and the awareness of the breeders themselves to continue to survive the pandemic conditions and FMD outbreaks. Currently, the goat population continues to increase while market opportunities improve. Thalib *et al.* (2011) stated that the demand for meat in the community is increasing. Rusdiana *et al.* (2015) reported that the population of goats and sheep has increased by around 4.75% every year, and small ruminants become one of the strategic commodities that can be developed in rural areas.

The problems that arise in livestock groups are the increasing need for feed and the accumulation of goat manure, due to the decline in demand and sales of goats in the market, so the population of goats in farmers increases. Solutions to meet feed needs are carried out by developing alternative innovations based on local resources. Quality alternative feed can maintain the quality of the condition of goat livestock (Kabeakan *et al.*, 2020). The increase in the goat population indirectly impacts the accumulation of produced goat manure. Goat manure has not been optimally processed and utilized, so it can potentially cause environmental pollution, such as unpleasant odors, ammonia, and the development of bacteria and fungi that can cause health problems. Waste management by optimizing the use of goat manure as an organic fertilizer

product can be a source of additional income for farming groups. Improving management in the goat farming business through counselling and training on production and marketing strategies can be one way to enhance the welfare of farmer group members (Ginting & Ritonga, 2018).

This strategy for community service is to synergize through the 4C concept approach, including (1) Critical Thinking, especially in determining problem analysis and alternative solutions to resolve problems experienced by the KUBE Sejahtera X Binangun 005 farmer group, (2) Creative Thinking, looking for various alternative solutions with creative concepts with the application of technology so that the process can be made effective to produce optimal solution outcomes, (3) Communication, through intense and effective communication to harmonize everything in resolving problems faced by partners, and (4) Collaboration, conducting collaboration through community assistance in implementing technology for increasingly advanced business applications and being able to produce optimal benefits or profits (Firdaus & Rosidah, 2020).

The purpose of this community service was to transfer knowledge and technology so that members of the KUBE Sejahtera X Binangun 005 farmer group could identify and utilize the potential of local resources, including agricultural and plantation waste in Sidoharjo village, to be processed into alternative feed for goats and can process goat manure into organic fertilizer products that have benefits and added value.

PROBLEMS

The problems that can be concluded from the situation that occurred in the KUBE Sejahtera X Binangun 005 farmer group were the need for alternative feed for goats and piles of waste from goat manure. The community service team provided solutions to overcome these problems by transferring knowledge and skills for silage processing from local resources and processing organic fertilizer from the main ingredient of goat manure.

METHOD OF ACTIVITY IMPLEMENTATION

Community service activities were carried out in June – August 2023 with partners from the KUBE Sejahtera X Binangun 005 farmer group located in Sidoharjo village, Samigaluh subdistrict, Kulon Progo district, D.I. Yogyakarta. The location of the KUBE Sejahtera X Binangun 005 farmer group is in the highlands of the Menoreh mountain area. The farmer group carries out the commodity of breeding goats. The stages in community service activities were problem analysis, formulation of solutions, counseling accompanied by training, and evaluation. Problem analysis by conducting discussions with the partner farmer group to collect secondary data, including the potential of local resources that can be used for alternative feed and the utilization of goat manure that has been done by partners. Problem-solving was prepared by considering the existing technology on campus (UGM) and aligned with the capabilities of local and human resources in the KUBE Sejahtera X Binangun 005 farmer group. Counseling for the knowledge transfer process by presenting experts who were competent in alternative feed and organic fertilizer processing. The counseling uses an interactive discussion method, delivering material followed by discussion, questions, and answers. The training was carried out with hands-on practice (processing silage and organic fertilizer). Experts provide examples by involving breeders; after that, breeders are invited to do it themselves accompanied by experts. Evaluation is carried out by looking at the participants' skills in carrying out independent practice and evaluating the resulting products, i.e., silage and manure, with the standard physical parameters of the product. Evaluation parameters for successful community service: breeders have the ability to identify local natural resources that can be utilized for animal husbandry, breeders have skills in alternative feed (silage) processing from local ingredients with silage quality meeting good physical standards for silage, and breeders have skills in processing goat manure into organic fertilizer.

Silage processing. Equipment used included a grass chopper, scales, plastic barrels with a capacity of 50 kg, and plastic tarpaulin. The materials used include odot grass (50 kg) and starter (molasses). The stages in silage processing consist of (1) Preparation stage: preparing a place for the silage processing by preparing a place protected from water and shaded and preparing a plastic tarpaulin for mixing the forage with a starter or a place with cement floor. Prepare the

forage/grass; the grass that will be silaged is withered for 24 hours. (2) Preparing the starter: selecting the starter to be used can be adjusted to the starter ingredients that are available and easy to find (such as molasses). (3) Silage processing stage: withered Odot grass was chopped to a size of 1-3 cm, then the chopped results were placed on a mat or floor, and the starter was added as much as 3-5% of the fresh weight of the grass to be made silage. The next step is mixing until the grass and starter are homogeneous. The mixed grass and starter are then put and compacted into a silo (plastic barrel), avoiding the presence of air in the barrel and then closing the silo (barrel) as tightly as possible (anaerobic conditions). The fermentation process took 21 days, and the silage product can be harvested and aired before being given to livestock. Processing of organic fertilizer. Organic fertilizer based on goat manure for a 50 kg formulation. The equipment used includes sacks with a capacity of 50 kg, hoes/shovels, buckets, scales, and manure grinding machines. The materials needed include goat manure (45 kg), EM4 starter bacteria, molasses, and dolomite lime. The stages in processing manure consist of (1) the Preparation stage: preparing a place for processing compost that is protected from water with good absorption (on soil or paving blocks) and protected from rain. It is best to carry out the fertilizer processing process under the shade. Fresh goat manure is taken and prepared with a water content of 60% (fresh goat manure generally has a water content of around 60%). The starter is made by mixing two bottle caps of EM4, 500 ml of molasses, and 500 ml of water into a bottle. Loosen the bottle cap so the gas formed during the starter propagation process can escape. The mixture is left for 2 x 24 hours before it is ready to use. (2) Manure process stage: prepare goat manure with an appropriate water content of 45 kg for each sack, and prepare 5 kg of dolomite lime. The starter that has been prepared in the bottle is taken and poured into the mixture. The compost materials are mixed and homogenized using a hoe or shovel, then put into a sack to rest for 35 days (5 weeks). Stirring (aeration) is done once a week by removing the sack's contents and mixing again. The harvested manure is then ground using a grinding machine. The fertilizer product will be crumbly and soft, making it easier for the soil to absorb the nutrients contained in the compost.

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RESULTS AND DISCUSSIONS

Community service activities based on assisted villages in the KUBE Sejahtera X Binangun 005 farmer group took the object of livestock farming with goat livestock commodities. The KUBE Sejahtera X Binangun 005 farmer group was located in Munggang Wetan Hamlet, Sidoharjo village, Samigaluh sub-district, Kulon Progo district, D.I. Yogyakarta at a distance from the Faculty of Veterinary Medicine UGM is about 29.7 km or 56 minutes away by car (Figure 1). The location was in the Menoreh mountain area. Sidoharjo village has a typology of undulating hills with a slope of 30-80%, ambient temperature of 23-28°C, and rainfall of 2500-3200 mm/year, with an average resident's land area ownership between 0.25-1 Ha. Based on hydrological aspects, river flows in the Sidoharjo village area form a River Watershed pattern. Munggang Wetan Hamlet has an irrigation canal that originates from the Besi River and Kedung Peri River. With this description of the area, Sidoharjo village has natural resource potential for development in the fields of agriculture and animal husbandry. Various plantation crops, vegetables, and fodder forage can grow well, especially during the rainy season.

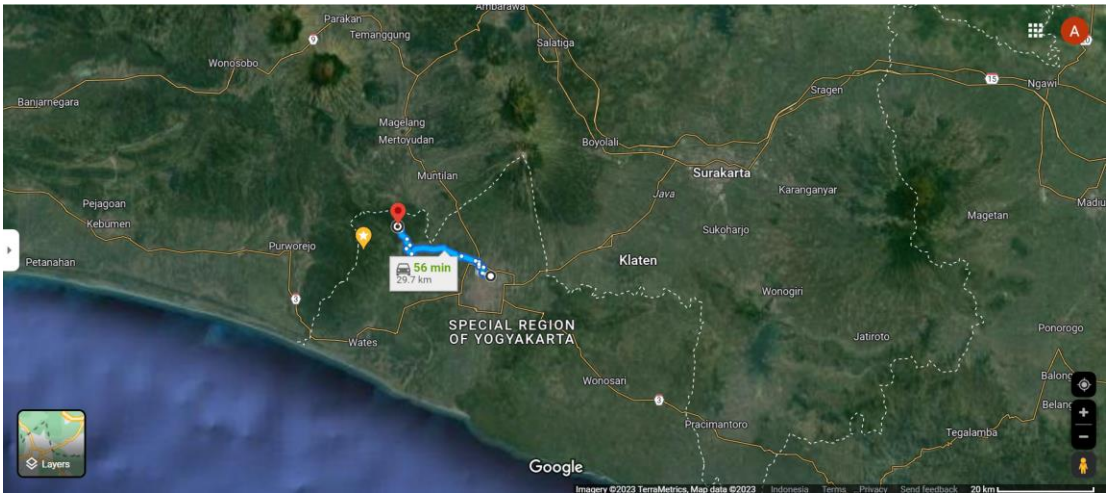

Figure 1. Location of the KUBE Sejahtera X Binangun 005 farmer group from Universitas Gadjah Mada (Google Map)

Identify local resources

The location of the KUBE Sejahtera X Binangun 005 farmer group was in an area passed by the Besi River and Kedung Peri River. There were also several springs that served as sources of

consumption and irrigation water for agriculture so that the area had potential natural resources that supported development in the agricultural sector and farms. The KUBE Sejahtera X Binangun 005 farmer group has a goat population of more than 90 goats. The bred goats were PE goats (Ettawa crossbreed) and Bligon goats. Local resources that have the potential to be utilized in livestock groups include stocks of agricultural and plantation waste such as corn cob, jackfruit leaves, and odot grass (*Pennisetum purpureum* cv. Mott), which can be processed for silage as feed for goats, and goat manure that has not been used optimally and does not have knowledge in processing goat manure. The current condition for the feed given to goats is fresh forage, and this problem will arise when the dry season arrives because forage will be very limited. The current condition for the feed given to goats is fresh forage, and this problem will arise when the dry season arrives because forage will be very limited.

The ability to identify local resources encourages farmers to be more creative in utilizing these resources. This ability to identify local resources becomes the essential capital for building and developing creativity that can help increase the economic value of products that can be produced from livestock. Agricultural and plantation waste with no helpful value can be generated into alternative feed using various methods, one of which is silage processing. Alternative feed has the benefit of being an option to provide nutrition for livestock when there are problems with the main feed that is often given, such as a scarcity of feed or the need for a lot of feed at a certain time. Feed is one of the most important needs in the ruminant farming business because feed functions to fulfill the living needs of the livestock. Feed availability must always be maintained to meet livestock needs (Muttaqin & Novia, 2011). The scarcity of feed can reduce livestock productivity, so feed must always be available (Harahap, 2017). An efficient feeding strategy is to utilize abundant local resources in the form of agricultural waste with nutritional value for livestock (Kustantinah *et al.*, 2008).

Farmers in the KUBE Sejahtera X Binangun 005 farmer group have other activities in the agricultural and plantation sectors. As a result of agriculture and plantations, there is harvest waste that can be used, such as corn cobs, jackfruit leaves, and Odot grass or Dwarf Elephant Grass (Pennisetum purpureum Schum cv. Mott), which is abundant in the rainy season. Agricultural waste can be used as an alternative feed ingredient through the silage process as goat feed and stored as animal feedstock in the dry season.

This agricultural waste has sufficient nutritional value as livestock feed. Corn cob is the part of the corn fruit after the kernels have been popped (Tangendjaja & Wina, 2006). The nutritional content of corn cobs consists of 29.54% water content, Dry Matter 70.45%, Crude Protein 2.67%, and Crude Fiber 46.52% (Mustofa *et al.*, 2012). Jackfruit leaves are suitable as an alternative forage in the face of the dry season because the jackfruit tree is easy to grow, even though it is less resistant to drought. However, because it is a perennial woody plant, its roots go deep into the ground to still get water. Jackfruit leaves contain 2.49% tannin, which can affect the consumption and digestibility of the jackfruit leaves themselves. Tannin also has the ability to act as an anthelmintic, especially for nematode helminth parasites (Daryatmo *et al.*, 2010). Odot grass is a type of grass that has high productivity and nutritional content. Odot grass is smaller in size than other types of elephant grass. Odot grass can grow in various soil types and responds to fertilization. Odot grass grows in clumps and continuously produces seedlings if pruned regularly. The abundant production and high nutritional content compared to other types of elephant grass give odot grass the potential to be used as animal feed in various forms, such as silage. The nutritional content of Odot grass harvested at 50 days consists of 16.59% dry matter, 82.81% organic matter, 12.72% crude protein, 32.35% crude fiber, and crude fat 2.28% (Wati *et al.*, 2018). Odot grass has a crude protein content of 11.90% (Tauqir *et al.*, 2007). Odot grass contains dry matter, including 33.72% cellulose, 18.80% hemicellulose, 3.72% lignin, and 12.26% crude protein (Urribarri *et al.*, 2005).

Strategies for problem solutions

As a result of meetings and discussions with the KUBE Sejahtera X Binangun 005 farmer group that have been held several times during routine group member meetings regarding problems and things that can be optimized, silage making for the use of agricultural waste as alternative feed and organic fertilizer processing was agreed upon by the farmer group. The community service team then made preparations by donating grass-chopping machines, plastic barrels for silage, and other equipment (Figure 2) needed for silage and organic fertilizer processing, including silage and organic fertilizer processing handbooks (Figure 3), as well as transferring knowledge and skills about silage and organic fertilizer processing.

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Figure 2. Grass chopper and other supporting equipment

Figure 3. Pocketbook for silage and organic fertilizer processing

Knowledge about silage and organic fertilizer processing is transferred using an interactive discussion method followed by training on silage and organic fertilizer processing (figure 4). This community service activity invited experts, such as Viagian Pastawan, S.Pt., M.Sc., Ph.D., IPP (Faculty of Animal Husbandry, Gadjah Mada University) for organic fertilizer processing and drh. Aan Awaludin, M.Sc (Livestock Production Study Program, Department of Animal Science, Politeknik Negeri Jember) for silage processing.

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Figure 4. Community Service Team and Kube Sejahtera X Binangun 005 farmer groups

Training on processing organic fertilizer was held on 26 July 2023, and training on processing silage was held on 27 July 2023, with a total of 30 farmers participating. Training activity consists of distributing pocketbooks on silage and organic fertilizer processing, delivering material from experts and discussions (Figure 5), practicing silage and organic fertilizer processing with assistance from experts (Figure 6 and Figure 11), and training participants carrying out self-practice.

Figure 5. Transfer of knowledge and discussion

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Local resources, including agricultural waste, Odot grass, and goat manure, are utilized by transferring knowledge about silage technology and manure processing. This knowledge will benefit breeders in the KUBE Sejahtera X Binangun 005 farmer group by increasing the value of benefits from local resources and overcoming problems that arise in the goat farming business. Livestock and agricultural waste, if not utilized, will have an impact on the environment in the form of air, water, and soil pollution, become a source of disease, can trigger an increase in methane gas, and also disrupt aesthetics and comfort (Nenobesi *et al.*, 2017).

Silage is a method of preserving fresh forage using fermentation methods and under anaerobic conditions to increase the shelf life of forage so that it can be used for a long time, especially during the dry season. Silage is also used when there is excess forage production during the rainy season so that excess production can be stored (Wati *et al.*, 2018). The principle of silage processing is forage fermentation by microbes that produce a lot of lactic acid under anaerobic conditions (Naif *et al.*, 2016). Apart from lactic acid bacteria, another additive that is usually added to silage is molasses. Molasses is useful as a source of soluble carbohydrates or WSC (Chalisty *et al.*, 2017). Silage processing for community service in the KUBE Sejahtera X Binangun 005 farmer group uses the main ingredient of odot grass, which is chopped into small pieces, including the stems, but in this training, it is also explained that apart from grass, the main ingredient for making silage can also use other agricultural waste such as corn cobs and leaves. The agricultural waste used for silage practice is jackfruit leaves, using the same process as silage made from dwarf elephant grass (Figure 8).

Figure 8. Processing silage with a mixture of jackfruit leaves

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Evaluation of the silage processing was carried out after 21 days by looking at parameters including color, texture, and aroma. The result of the silage processing practice of the KUBE Sejahtera X Binangun 005 farmer group is a brownish-green silage product, intact with a crumb texture, sweet aroma, and no mold (Figure 9). The results of the silage product are normal and good, and this means that the breeder understands how to process silage and understands the principles of making alternative feed using the fermentation process.

Figure 9. Silage products of the KUBE Sejahtera X Binangun 005 farmer group

Color is one of the parameters for assessing the physical quality of silage products. The results obtained from silage processing are brownish-green. The presence of the pigment phatophytin causes the brown color of silage (Hidayat, 2014). The color of the silage product is bright green or brownish green, which is a normal color for grass silage, while the abnormal color is blackish (Wati *et al.*, 2018). Silage processing is rated as successful if the silage produces a crumbly silage texture (Hidayat et al., 2012). The silage with a fresh, sour aroma is good quality silage (Zakariah *et al.*, 2015). The sour aroma produced by silage is caused by anaerobic bacteria which produce organic acids. The presence of mold was not found in the silage products made. A good silage product can be judged by the absence of mold growing because lactic acid bacteria develop well during the fermentation process, so there is no mold in the silage (Kurnianingtyas *et al.*, 2012). A good fermentation process is under anaerobic

conditions. In such conditions, fungi will not grow, and only bacteria that are still active, especially acid-forming bacteria, will be able to grow (Herlinae *et al.*, 2015). The presence of mold in failed silage processing was caused by the fact that the silo in which it was held still had air cavities, so it was possible that the fermentation process was not completely anaerobic. This condition causes oxygen to enter so that mold grows (Chalisty *et al.*, 2017).

Manure, as the final result of livestock businesses, has the potential to be managed into organic fertilizer such as compost, which can be used to increase environmental carrying capacity, increase crop production, increase farmer income, and reduce the impact of pollution on the environment (Nugraha & Amini, 2013). Organic fertilizer consists of various natural fertilizer ingredients such as manure, animal body parts, and plants, rich in minerals and good for use as soil fertilizer. Goat manure is an organic fertilizer because it contains nutrients 1.26% N, 16.36 mg/kg P, 2.29 mg/L Ca, Mg, and 4.8% organic, which plants and soil fertility need. Goat manure can be used as organic fertilizer with simple processing to maximize the fertilizer content (Osso *et al.*, 2011). Processing organic fertilizer is carried out using goat manure as the main ingredient. In addition to providing material on organic fertilizer processing, the activities carried out also provided information on using organic fertilizer made from goat manure as the main ingredient. An area of 1 hectare can meet its fertilizer needs with 1-2 tons of organic fertilizer. Manure can also be used to mix planting media in pots with a ratio of 1 part organic fertilizer: 1 part soil (1: 1) and then mixed. The advantages of manure are that it is environmentally friendly, can increase farmers' income and can increase soil fertility by repairing physical damage to the soil due to excessive use of inorganic (chemical) fertilizers (Subekti, 2015). The organic fertilizer product was evaluated after 35 days with parameters including color, aroma, and texture. The organic fertilizer product from the KUBE Sejahtera X Binangun 005 farmer group is a blackish-colored product, odorless, cool or appropriate to environmental temperature, and intact but crumbly. Mature fertilizer has the characteristics of being dark brown to black in color, crumbly texture, room temperature, and odorless. Manure processing that fails can show the presence of maggots, mold, and an unpleasant odor (Surya *et al.*, 2021).

Evaluation of community service activities: there is a change in attitude and an increase in farmers' knowledge and skills in the KUBE Sejahtera X Binangun 005 farmer group in identifying local resources and having the creativity to utilize them in alternative feed and organic fertilizer. Silage and organic fertilizer products produced by farmers meet the physical criteria according to product standards.

CONCLUSION AND SUGGESTIONS

Community service activities in the KUBE Sejahtera X Binangun 005 farmer group in Sidoharjo village achieved the targeted goals. Farmers can recognize and identify valuable local resources to support goat farming activities. Farmers can understand and carry out silage and manure processing with good product results. Suggestions that can be given are for farmers to be able to make these products sustainably and can be commercialized to increase the economic level of the livestock sector.

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