

An Improvement of Livestock Feed Quality Through the Production of Fermented Complete Feed in the Karya Manunggal Livestock Group, Donokerto, Turi, Sleman, Yogyakarta

Moh. Sofi'ul Anam^{1*}, Aji Praba Baskara¹, Ali Agus¹, Erif Maha Nugraha Setyawan², Najmu Tsaqib Akhda³

¹Department of Animal Nutrition and Feed Science, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia

²Department of Reproduction, Obstetrics and Gynecology, Faculty of Veterinary Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia

³Department of Agricultural Socio-Economics, Faculty of Agriculture, Universitas Gadjah Mada, Yogyakarta, Indonesia

Submitted: November 16th 2023; Revised: February 15th 2024; Accepted: February 15th 2024

Keywords:

Feed technology
Fermented complete feed
Livestock
Quality

Abstract This community service aimed to assist farmers in improving their knowledge and quality of feed by producing fermented complete feed (FCF). The community service occurred from June to November 2023 in the Karya Manunggal livestock group in Donokerto, Turi, Sleman. The activities included observing the initial conditions of the group, providing counseling, conducting FCF production training, evaluating the products, and utilizing the trained products for the livestock. The results of the activities indicated an increase in farmers' knowledge about manufacturing concentrate and feed supplements, feed preservation technology, and FCF, each by 80%, 73%, and 95%, respectively. Farmers successfully produced FCF with good quality, as indicated by the acidic pH of 4.31. The palatability of FCF was also excellent for livestock. The average daily gain in sheep with FCF supplementation was 0.156 grams/head/day, while the farmers' feed supplementation was 0.113 grams/head/day. The community service activities in the Karya Manunggal livestock group conclude the improvement of farmers' knowledge and skills in terms of livestock nutritional needs, balanced feed formulation, and the utilization of fermentation technology in feed production. The success of these activities is also evident in the increased effectiveness of feed and cost efficiency following the implementation of FCF.

1. INTRODUCTION

Increasing the population will impact the consumption of animal protein. The effort to meet the demand for animal protein is challenging for those involved in the livestock sub-sector. The development of beef and sheep farming is not only aimed at national animal protein production but also at improving food security and increasing the purchasing power of the population through income improvement (Rusdiana & Praharani, 2019). Furthermore,

most ruminant livestock is kept by smallholder farmers who have not achieved optimal livestock productivity (Agus & Widi, 2018).

The quality and quantity of the feed consumed largely determines livestock productivity. Nutrient adequacy is crucial as it can affect the dynamics of microbial fermentation processes in the rumen (Haryanto, 2012). Ruminant feed generally consists of forage and concentrate.

ISSN 2460-9447 (print), ISSN 2541-5883 (online)

*Corresponding author: Moh. Sofi'ul Anam

Department of Animal Nutrition and Feed Science, Faculty of Animal Science, Universitas Gadjah Mada, Jl. Fauna No. 03, Yogyakarta 55281, Indonesia
Email: m.sofiul.a@mail.ugm.ac.id

Copyright ©2024 Jurnal Pengabdian kepada Masyarakat (Indonesian Journal of Community Engagement)
This work is distributed under a Creative Commons Attribution-ShareAlike 4.0 International License

Forage refers to plant materials, primarily grass and legumes, containing more than 18% crude fiber in dry matter, which can be used as animal feed (Tillman et al., 1998). Murtidjo (1993) added that concentrate for ruminant livestock is generally referred to as supplementary feed or raw feed material with a crude fiber content of less than 18% and is easily digestible. Adding supplementary feed to basal forage in ruminants can increase feed consumption, thus, qualitatively and quantitatively meeting the nutritional needs of livestock. Adding supplementary feed also ensures the availability of energy and nutrients for rumen microbial life (McDonald et al., 2010).

Feed is one of the most critical components in livestock farming. This component accounts for almost 70% of the entire farming operation. Thus, good feed management is a crucial determinant of livestock farming success. Furthermore, the development of ruminant livestock heavily depends on the availability of forage or pasture on grazing lands. Indonesia benefits from having two seasons, the dry and rainy seasons, which support the livestock sector in providing fibrous feed for ruminant animals. However, the quantity of forage in the dry season is less abundant than in the rainy season, affecting livestock productivity. Fermented feed is produced to preserve and minimize the loss of nutrients and improve feed nutrition (Jaelani et al., 2014). Complete Feed is a feed formulation technology that mixes all feed ingredients consisting of forages (agricultural waste) and concentrates combined into one without or with only a handful extra fresh grass. Complete Feed is a balanced diet that has been fully equipped to meet the nutritional needs of cattle, good for growth, tissue maintenance and production (Sadeli et al., 2019).

The Karya Manunggal Livestock Group is a community organization of cattle and sheep farmers in Donokerto Village, Turi District, Sleman Regency. The issue faced by the Karya Manunggal Livestock Group is the need for more knowledge among its members about feed technology. This is crucial because livestock productivity will only reach its maximum potential if the nutritional needs of the animals are adequately met. The community within the group is still accustomed to using conventional methods, such as providing low-quality feed like rice straw. As a result, the growth of livestock body weight is not optimal, and there are sometimes cases of repeat breeding when female cattle are mated. However, the potential feedstock for livestock in the Sleman Regency area is abundant. Given this potential and with proper management, livestock farmers should be able to manage feed effectively for the benefit of the group.

One solution to address the shortage of livestock feed in the Karya Manunggal Livestock Group is to produce fermented complete feed (FCF) that contains complete and balanced nutrients. The FCF is a mixture of several feed ingredients or concentrates that contain whole nutrients for animals at specific physiological stages, formed and given as the sole feed that can meet basic living and production needs. The advantage of producing fermented complete feed is to provide a complete and practical ration for animals, with adequate nutritional value for livestock needs.

It can be targeted at improving the feed delivery system. The fermentation process carried out on complete feed aims to extend the shelf life of complete feed.

2. METHOD

The mentoring activities were conducted in the livestock group "Karya Manunggal," Donokerto Village, Turi Subdistrict, Sleman Regency, Yogyakarta Province, from June to November 2023. The stages of the activities included preparation, such as observing the initial conditions of the livestock group, counseling, training, and implementing the mentoring results. The materials used included livestock records, pre- and post-activity questionnaires, counseling materials, training materials such as forage and concentrate, and training tools such as a chopper, scales, buckets, plastic drums, and tarps.

2.1 Preparation stage

During the preparation stage, interviews and discussions were conducted with the members, recording livestock data, farmer data, and issues faced in cattle and sheep management. Site observations and pre-tests were carried out with the farmers. The pre-test results were calculated to assess the initial capabilities of group members regarding the material that would be presented during the mentoring activities.

2.2 Counseling stage

The counseling stage involved delivering mentoring materials through presentations during group meetings. Meetings were scheduled as part of the service commitment and were held after farmers had completed their work in the barns (from 4.00 to 6.00 pm). The content focused on introducing feed materials, formulation, quality control, and feed technology (FCF). During the counseling sessions, discussions were also conducted between the community service team and group members regarding counseling topics related to cattle and sheep management.

2.3 Training stage

The training for making FCF was conducted in several steps. Elephant grass, as a source of fiber, was harvested a day before FCF production, then allowed to air-dry and placed in an upright position in a dry and shaded area. The elephant grass was weighed and then chopped to about 3-5 cm using a chopping tool and evenly spread on a tarp. Based on the formulation, materials such as cassava, rice bran, soybean meal, palm kernel meal, copra meal, coffee husk, molasses, mineral premix, and peanut husk were weighed according to the formulation. Each of these materials was evenly scattered over the elephant grass. Next, molasses (2%) and probiotic source (Saus Burger Pakan®) (200 ml) were dissolved in 1 liter of water. This solution was sprayed evenly over the surface of the materials and stirred until well-mixed. The resulting mixture was gradually placed into a plastic drum and compacted. Finally, the plastic drum was tightly sealed and secured with a clamp. After a 21-day feed fermentation process, the FCF was opened, and its quality was tested.

2.4 Utilizing training results and evaluation stage

The FCF produced during the training was provided to the sheep owned by the farmers who were group members, in the group's barn. Feeding was carried out for 21 days, and the weight of the sheep was recorded before and after the FCF feeding. Throughout this phase of the activities, the community service team accompanied the farmers in the field, discussing the results obtained by the farmers. Mentoring was conducted by observing livestock feed consumption with the farmers, accompanied by discussions every two days in the group's barn. Students participating in this community service activity took turns visiting the farmers. The overall community service activities were evaluated based on the farmers' involvement, the difference in values between the pre-test and post-test, the success in making the product during the training, and its utilization.

3. RESULT AND DISCUSSION

Activities that have been carried out include counseling and training in making Fermented Complete Feed as well as practice and evaluation of giving Fermented Complete Feed to livestock.

3.1 General condition of the livestock group

Livestock commodities raised by the Karya Manunggal livestock group consist of cattle and sheep. The total livestock population reaches nine cattle and 64 sheep. The total number of members of the Karya Manunggal livestock group is 20, with 12 active members. The main occupation of the majority of group members is farming. The average age is approximately 48 years, with the majority having a high school education level. Livestock feeding includes forage, with concentrated feed as an additional supplement. The forage provided includes kolonjono grass, straw, grass, and others.

In the context of livestock management, interview findings indicated issues, such as insufficient feed to meet the livestock's needs. For example, forage was supplied at approximately 20 kg for a 300 kg weight cattle (6% of body weight). However, according to livestock requirements, the forage should have been a minimum of 10% of body weight. The amount of concentrate provided was also relatively limited (using the wet method). In this approach, farmers supplied a substantial amount of water with a small addition of concentrate, typically just one ladle (± 200 grams).

Moreover, considering the dry season, the availability of forage, both in quantity and quality, posed a significant challenge for farmers to secure. In such circumstances, farmers provided whatever feed was accessible. The inadequate nutrient intake for the livestock resulted in various issues, including suboptimal weight gain, as the animals were merely getting enough to satisfy hunger. Consequently, efforts were still needed to address these feed-related challenges, spanning from feed formulation to processing. Yanti et al. (2021) said giving complete feed to ruminants provides excellent benefits because with complete feed all the nutritional needs of livestock are met. Complete feed is also a solution to improve the quality

of agricultural waste. On the other hand, preservation of feed in dry season, especially in Indonesia, is by silage. Complete feed silage provides a solution for feeding ruminants in the tropics. Silage with additives will provide better fermentation quality.

Some farmers had attempted to create fermented feed based on information obtained from social media. Nevertheless, the outcomes could have been more optimal, with issues such as fungal growth and the acidity level of the fermented feed (Figure 1). The lack of farmer knowledge emerged as a factor contributing to the shortcomings in feed production.



Figure 1. The condition of the fermented feed made by farmers before receiving mentoring

3.2 Counseling and training

Extension activities were conducted by providing information on livestock feed, specifically for ruminant animals such as cattle, goats, and sheep (Figure 2 (a)). The counseling material was related to the correct formulation method of rations based on the body weight of the animals and their production phase, ensuring that the nutritional needs of the animals were met. The counseling sessions also included information on the classification of feed ingredients based on their nutrients. Participants were given material on the qualities of good feed to avoid adverse effects on the animals. They were also provided information on considering the price of feed ingredients in formulating rations to ensure the economic rationality of the formulated feed. The results of the feed formulation can be seen in Table 1 – the calculation of the feed formulation referred to the table of animal nutrient requirements.

The practice of feed production was carried out by utilizing fermentation technology. Forage limitation during the dry season could be overcome by preserving forage using silage technology. Improving nutrient quality to meet the needs of ruminant livestock while preserving forage and feed materials could be achieved by utilizing FCF technology. The feed-making training activities were conducted smoothly and attended by Karya Manunggal livestock group members (Figure 2 (b)). The participants showed excellent enthusiasm, and the training was interactive, involving dialogue and questions from the participants with the training team. The feed-making training session concluded with the fermentation process of



Figure 2 . (a) Feed counseling; (b) FCF production; (c) FCF results after fermentation for 21 days; (d) Feed evaluation

the prepared feed, which was then opened and utilized 21 days after the feed was made (Figure 2 (c)). Legawa (2021) said The feed ingredients used to make fermented complete feed are mixed and then compacted and fermented for 21 days.

Table 1 . Feed ingredients of fermented complete feed

Feed ingredients	Proportion (%)
Grass	20.00
Cassava	8.00
Rice bran	16.00
Soybean meal	13.00
Palm kernel meal	13.00
Copra meal	10.50
Coffee husk	7.00
Peanut husk	10.00
Molasses	2.00
Premix	0.50
Total	100.00

3.3 Feed evaluation

Feed production was evaluated utilizing fermentation technology after a 21-day fermentation process (Figure 2 (d)). The evaluation was performed using sensory or organoleptic testing methods and determining the pH of the prepared feed. The evaluated feed was then applied to the livestock, and the livestock’s development was assessed regarding weight gain (gain) and ADG (average daily gain). Livestock performance was evaluated by comparing the feed commonly used by Karya Manunggal livestock group members with the results of FCF production. The results

of the feed technology production activities can be seen in Table 2.

Table 2 . The results of the assessment of the quality of fermented complete feed

No	Items	Day-0	Day-21
1	pH	6.83	4.31
2	Color	Green	Green, with a small quantity of brown
3	Texture	Crumbly/ firm	Soft
4	Smell	Forage	Acid
5	Contamination	No	No

The feed quality can be assessed based on the preference level of livestock. The feed produced using fermentation technology was then applied to the livestock, and it was found that the prepared feed had excellent palatability because the animals liked it very much. The livestock had a high preference for the feed that had been made. The FCF produced was found to have good quality in terms of color, texture, smell, and contaminants.

Feed evaluation continued with the assessment of the performance of livestock given FCF. The assessment was conducted by comparing the performance of livestock given FCF with the feed commonly used by farmers. The parameters used were gain and ADG in livestock. It was found that FCF technology resulted in better livestock performance than the feed commonly used by farmers. Based on average daily gain (ADG), it was observed that the provision of FCF could increase ADG by 156 grams/head/day compared to the ADG from the usual feed

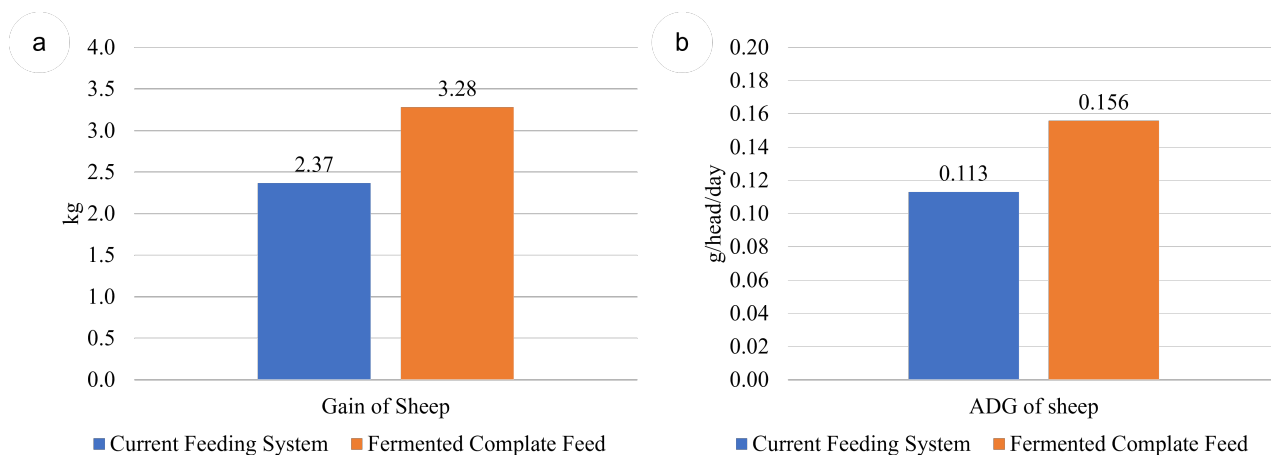


Figure 3 . (a) Gain of sheep; (b) Average daily gain of sheep

provided by farmers, which was only 113 grams/head/day. Economic evaluation based on the B/C ratio obtained from the application of FCF technology was 1.61 compared to the B/C ratio from the usual feed management method that farmers commonly apply, which was 1.02. These results indicate that with a slight increase in feed costs, livestock weight gain can be improved in the same period. The larger B/C ratio of FCF compared to the B/C ratio of farmer’s feed indicates that FCF technology can increase farmer income. Suwignyo et al. (2015) said fermented complete feed has a brownish yellow color, soft texture, not moldy, and the pH value ranged from 4.5 to 5. Fermented complete feed for sheep can affect consumption of total digestible nutrients, average daily gain, and farmer’s income. Fermented complete feed with local waste product can be used as an alternative feed mainly during the dry season when forage and legume are very limited. The results of the livestock performance evaluation can be seen in Figure 3.

3.4 The farmers’ competence achievement

Before undergoing training on the production of concentrates and feed supplements, the farmers’ competence was only at a percentage of 8.34% (Figure 4). Figure 4 indicates that the participating farmers needed more mastery in producing concentrates and feed supplements. However, there was a significant improvement after the training, with a competence increase of 80%. Similarly, the farmers’ competence before training on feed preservation technology was only at a percentage of 6.67%, indicating a need for more understanding in that field. After the training, there was a 73% increase in competence. Regarding FCF, the farmers’ competence before the training was only at a percentage of 4.45%, signaling a limitation in knowledge in that area. However, after the training, there was a significant increase in competence, reaching 95%. Guntoro et al. (2016) said that the strongest motivation to drive business is economic motivation. In this case, increasing gain and average daily gain is the strongest motivation for sheep farmers in Karya Manunggal Ika. Various aspects of the production of concentrates and feed supplements, including the FCF production method, the purpose of FCF production, and the

success of FCF production, all involved increased farmers’ competence. Overall, the positive results in improving farmers’ competence indicate the training program’s success.

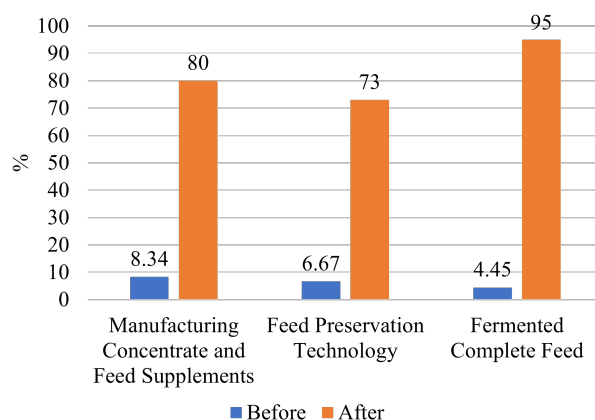


Figure 4 . (a) Gain of sheep; (b) Average daily gain of sheep

4. CONCLUSION

The community service activities in the Karya Manunggal livestock group conclude the improvement of farmers’ knowledge and skills in terms of livestock nutritional needs, balanced feed formulation, fermentation technology in feed production, livestock health management, and overall farm management. The success of these activities is also evident in the increased effectiveness of feed and cost efficiency following the implementation of feed supplementation technology and fermented complete feed.

ACKNOWLEDGMENT

We would like to express our gratitude to Universitas Gadjah Mada’s Directorate of Community Service (DPkM) for facilitating community service programs based on the utilization of research findings and the application of appropriate technology for the fiscal year of 2023 (No. 608/UNI/DPM/Dit-PKM/PM.01.03/2023).

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest in this publication.

REFERENCES

- Agus, A., & Widi, T. S. M. (2018). Current situation and future prospects for beef cattle production in Indonesia-A review. *Asian-Australasian Journal of Animal Sciences (AJAS)*, 31(7), 976–983. <https://doi.org/10.5713/ajas.18.0233>
- Guntoro, B., Suranindyah, Y. Y., Suryanto A. A. & Opatpatanakit, Y. (2016). Farmer's motives in raising ettawa crossbred goat in Yogyakarta, Indonesia. *International Business Management*, 10, 2706-2712.
- Haryanto, B. (2012). Perkembangan penelitian nutrisi ruminansia. *Wartazoa*, 22(4), 169–177.
- Jaelani, A., Gunawan, A., & Asriani, I. (2014). Pengaruh lama penyimpanan silase daun kelapa sawit terhadap kadar protein dan serat kasar. *Ziraa'ah*, 39, 8–16.
- Legawa, M. M., Utomo, R., Noviandi, C. T., & Astuti, A. (2021). The effect of fermented completed feed and silage as a forage replacement in the production and milk quality of friesian holstein crossbred. *9th International Seminar on Tropical Animal Production*, 18, 49-54. <https://doi.org/10.2991/absr.k.220207.011>
- McDonald, P., Edwards, R. A., Greenhalgh, J. F. D., Morgan, C. A., Sinclair, L. A., & Wilkinson, R. G. (2010). *Animal nutrition 7th edition*. Prentice Hall.
- Murtidjo, A. B. (1993). *Memelihara kambing sebagai ternak potong dan perah*. Kanisius.
- Rusdiana, S., & Praharani, L. (2019). Pengembangan peternakan rakyat sapi potong: Kebijakan swasembada daging sapi dan kelayakan usaha ternak. *Forum Penelitian Agro Ekonomi*, 36, 97–115.
- Sadeli, A., Hanafi, N. D., & Tafsin, D. (2019). Application of science and technology based on local feed waste for livestock farmer group in Tuntungan II Villages, Pancur Batu, Deli Serdang Regency. *Journal of Saintech Transfer (JST)*, 2(2), 132-141. <https://doi.org/10.32734/jst.v2i2.1007>
- Suwignyo, B., Munawaroh, L. L., & Budisatria, I. G. S. (2015). Effect of material and fermentation time on quality and digestibility of complete feed, average daily gain of bligon goat and farmer's income. *Journal of the Indonesian Tropical Animal Agriculture*, 40(1), 23-30. <https://doi.org/10.14710/jitaa.40.1.23-30>
- Tillman, A.D., Hartadi, H., Reksohadiprodjo, S., Prawirokusumo, S., & Lebdosukojo, S. (1998). *Ilmu makanan ternak dasar*. Gadjah Mada University Press.
- Yanti, Y., Riyanto, J., Dewanti, R., Cahyadi, M., Wati, K., & Pawestri W. (2021). The fermentation quality of complete feed with FJLB silage additive from tropical grass. *IOP Conference Series: Earth and Environmental Science*, 824. <https://doi.org/10.1088/1755-1315/824/1/012060>