

Assistance in Silage Making to Increase Community Capacity in Providing Forage During the Dry Season for Ruminant Livestock

Umbu A Hamakonda^{1,a)}, David Januarius Djawapatty²⁾, Victoria Ayu Puspita³⁾, Ferdinandus Bai⁴⁾, Anggela Marici Bupu⁵⁾

¹Agrotechnology Study Program, Sekolah Tinggi Pertanian Flores Bajawa, Nusa Tenggara Timur, Indonesia

²Farm Study Program, Sekolah Tinggi Pertanian Flores Bajawa, Nusa Tenggara Timur, Indonesia

³Agrotechnology Study Program, Sekolah Tinggi Pertanian Flores Bajawa, Nusa Tenggara Timur, Indonesia

⁴Farm Study Program, Sekolah Tinggi Pertanian Flores Bajawa, Nusa Tenggara Timur, Indonesia

²Farm Study Program, Sekolah Tinggi Pertanian

⁵Agrotechnology Study Program, Sekolah Tinggi Pertanian Flores Bajawa, Nusa Tenggara Timur, Indonesia

Corresponding author: umbu1991hamakonda@gmail.com

ABSTRACT

The continuous availability of forage throughout the year, both in quality and quantity, is an absolute requirement for livestock development. Forage that is abundant during the rainy season must be processed by preserving it so that the nutritional quality of the forage remains guaranteed. One technology for processing feed using preservation techniques is making silage. Making silage is done to preserve and minimize nutrient loss and can also improve feed nutrition. The main problem faced by goat farming groups in West Lengkosambi Village, Riung District, Ngada Regency, is the provision of quality and continuous feed. To increase breeders' knowledge about making goat feed using the silage process, it is necessary to provide training to breeders in Lengkosambi Barat Village, Riung District, Ngada Regency. This training activity was carried out on 11-12 October 2024. 57 participants attended the silage-making training. Participants' enthusiasm was very high when taking part in the silage-making training. Participants have the willingness to play an active role in making silage. This activity concludes that the training carried out was able to increase the knowledge and skills of members of the West Lengkosambi Village goat farming group regarding the benefits and techniques for making silage and its use as goat feed. Providing quality feed during the dry season can be overcome so that livestock growth and production levels will be achieved optimally.

ARTICLE INFO

Article History:

Submitted/Received 9 Oct 2024

First Revised 19 Oct 2024

Accepted 20 Oct 2024

First Available online 21 Oct 2024

Publication Date 21 Oct 2024

Keyword:

Forage

Ruminant livestock

Feed

Silage

INTRODUCTION

Raising dairy goats is an alternative diversification of livestock production. This fact shows that the need for milk in Indonesia continues to increase in line with the increase in population. Goat's milk also has its advantages compared to cow's milk, including that goat's milk is more easily digested by humans because most of the fat and protein particles are finer and more easily assimilated (Belanger, and Bredesern, 2018). Dairy goat development businesses often experience the problem of scarcity of forage, especially during the dry season. The continuous availability of forage throughout the year, both in quality and quantity, is an absolute requirement for livestock development. Previous research reports that forage availability varies depending on location, weather, season, and soil quality (Nurlaha *et al.*, 2015).

Smallholder farmers in rural areas provide feed only by relying on pastures (Onesimus *et al.*, 2015). Forage that is abundant during the rainy season must be processed by preserving it so that the nutritional quality of the forage remains guaranteed so that it can meet the feed needs of ruminants throughout the year. One technology for processing feed using preservation techniques is making silage. Silage-making is done to preserve and minimize nutrient loss and can also improve feed nutrition (Jaelani *et al.*, 2014). Silage is forage (HMT) that is preserved by anaerobic fermentation in conditions of high water content (60-70%) with the presence of acid formation. Making silage is usually added with additives in the form of molasses, urea, and bran.

Based on the type of livestock, livestock businesses are divided into two, namely ruminant livestock and non-ruminant livestock (Adli *et al.*, 2017). Forage is an important factor for livestock survival. The continuous availability of forage throughout the year, both in quality and quantity, is an absolute requirement for livestock development. Previous research reports that forage availability varies depending on location, weather, season, and soil quality (Nurlaha *et al.*, 2015). Smallholder farmers in rural areas provide feed only by relying on pastures (Onesimus *et al.*, 2015). Apart from that, coffee plantation areas are also reported to be a source of forage for livestock (Kleden *et al.*, 2015).

The problem generally experienced by farmers in livestock cultivation is limited feed availability. The problems faced by livestock groups as partners are supported by previous research, including that the availability of feed in the dry season can be very limited (Supriadi, 2015). Previous research also reported that in the development of livestock in general and ruminants in particular, the availability of feed ingredients is insufficient both in terms of quality and quantity (Suyasa *et al.*, 2017). Adequate feed originating from forage plants is known to increase livestock productivity (Aisyah *et al.*, 2022). The problem experienced by livestock groups as partners in this PkM activity is that it is difficult to obtain forage for ruminant livestock during the dry season. The problem of limited feed availability in the dry season is also experienced by the Mawar Desa Women Farmers Group (KWT). Quaken North Central Timor Regency, East Nusa Tenggara, so that some farmers release their livestock and even climb tall trees to get food (Bira *et al.*, 2021). Silage is said to be one of the feed technologies that can be recommended for areas that experience a dry season in one year (Prasetyo, 2019).

The problem of difficulty in obtaining forage during the dry season will have an impact on the productivity of ruminant livestock. Previous research reported that the availability of feed, both in terms of quality and quantity of feed in the dry season, is known to influence livestock productivity itself (Abrar *et al.*, 2019). Previous research also reported that the production and reproductive performance of livestock in grazing areas is influenced by seasonal changes which hurt the availability and quality of forage (Manu, 2014).

To overcome the problems experienced by partners, the PkM team from the Flores Bajawa Agricultural College offered training and assistance solutions for making silage for ruminant animal feed. Previous PkM activities reported that silage was the right solution to overcome feed availability both in terms of quality and quantity (Suryaningsih, 2022). Apart from that, the practice of making silage is also

known to be an alternative for providing feed in the dry season (Asminaya *et al.*, 2021). Practice Silage making is reported to be able to preserve and minimize nutrient reduction and can improve animal feed nutrition (Jaelani *et al.*, 2014)

The goal to be achieved from this activity is that partners, in this case students, have increased knowledge and skills in making silage for ruminant livestock. Previous research also reported that the ultimate goal of silage-making training is that partners can make quality silage so that population and productivity increases can be achieved optimally (Saelan & Lestari, 2021). Apart from that, silage can be used by farmers to support sustainable feed availability (Borreani *et al.*, 2018).

METHOD

Place and time of implementation

This community service activity in the form of silage-making training was carried out at the West Lengkosambi Village Livestock Group, Riung District, Ngada Regency on 11-12 October 2024.

Activity partners

Partners for the silage-making training activity. A total of 57 participants were all members of the West Lengkosambi livestock group, Riung District, Ngada Regency.

Stages of activity

Several stages are passed in implementing this training activity, including:

1. Socialization of activities

Training outreach activities are carried out with intensive communication between the Community Service (PkM) Team and the livestock group chairman and administrators. Communication is carried out by discussing several aspects regarding the time and place of training, attendance of training participants, provision of training materials, rental of processing equipment, as well as implementation, and various post-training aspects.

2. Preparation of training materials

The day before the training, raw materials and equipment used are prepared. A total of approximately 50 kg of forage in the form of odot grass and natural grass was cut from the group's garden and then in *chopper*. Other ingredients such as bran, rice bran and molasses are prepared at the training location. Equipment in the form of drums, buckets, shovels, plastic sheeting, and other equipment is also prepared at the training site.

3. Training activities

- Delivery of material: Delivery of material about the benefits of making forage silage for the development of dairy goat livestock. Apart from that, the requirements needed for making silage are also conveyed so that the quality of the silage produced is good. Next, material on techniques/how to make good silage is presented, especially the stages starting from chopping the feed ingredients to storing the silo drum in a safe place.
- Demonstration: The speaker demonstrates how to make silage directly in front of the farmer. The steps taken are to spread a wide tarpaulin/plastic, 50 kg of forage that has been chopped, spread it on the tarpaulin then sprinkle the bran and rice bran evenly, then sprinkle the molasses evenly. The ratio of forage : concentrate : additive refers to the formula 7:2:1. After all the ingredients are stirred and thoroughly mixed, the homogenized ingredients are put into the silo drum and then compacted until they fill all parts of the silo drum. Then close it and press it firmly, so that no air gets inside, tie

the drum lid with a lock to make it stronger. Store in the shade and not exposed to direct sunlight. Silage can be opened at 21 days of storage.

- Evaluation Evaluation is carried out during the activity, starting from the delivery of counseling material and practical activities for making silage. Evaluation includes the enthusiasm of the training participants and the improvement of the participant's skills in making silage.

Community service activities (PkM) this is carried out using the socialization method, demonstration of silage making by the presenter and independent practice of making silage by partners. Socialization, demonstrations and independent practice of making silage are aimed at livestock groups as partners. The outreach was carried out to provide knowledge about silage. The silage making demonstration aims to provide basic knowledge and skills before making silages independently, while the independent practice aims to hone partners' skills in making silages independently. Socialization is carried out using lecture techniques while demonstrations and practice Making silage independently are done directly in the field. Planned activities must meet three main requirements which include planning, implementation and evaluation (Qasim, 2016). The steps for PkM activities will be presented in Table 1.

TABLE 1. Community Service (PkM) activities

No	Activity Planning	Implementation	Evaluation
1	The PkM team plans PkM activities	time, place of implementation and socialization materials; time, place of demonstration and practice silage making	Coordination with several lecturers in related fields, coordination with the campus to lend rooms and laboratories, making schedules for socialization, demonstrations, practice making silage, and issuing assignment letters
2	Socialization with partners about silage	The speaker explained material about the meaning of silage, the materials for making silage, the function and benefits of silage for livestock, and the process of making silage	Discussion between participants and presenters
3	Demonstration of silage-making by the speaker	The speaker demonstrated how to make silage directly in front of partners.	Partners understand the process of making silage
4	Practice making silage independently by partners	Mitra, accompanied by the speaker, carried out the practice of making silage.	Partners can make silage well independently.

RESULTS AND DISCUSSION

The results and discussion of this community service activity will be described in full according to the steps described in the method above.

PkM Team Designs PkM Activities

The activity design is the initial activity before the PkM activities are carried out. This activity was carried out using a discussion method involving all members of the PkM team. Several important points

were discussed in this activity which could support the success of this PkM service activity. Several important points discussed in this activity include determining partners; time, place of implementation and socialization materials; time, place of demonstration, and practice silage making. The results of the activity of designing PkM activities by the team agreed to all the important points discussed in this activity. The atmosphere of the PkM activity design activity is as in Figure 1.



FIGURE 1. PkM Team Designing PkM Activities

Community service activities, in this case making silage, need to carry out thorough activity preparation which includes determining partners, outreach, practice, application and evaluation and monitoring (Ramdhan *et al.*,2016)

Socialization to Partners about Silage

Socialization is carried out to provide basic knowledge for partners before carrying out the practice of making silage independently. The material presented in the socialization included the meaning of silage, the ingredients in making silage, the function and benefits of silage for livestock and the process of making silage. The results of the socialization showed that partners were very serious about listening to the material presented by the presenters. This is marked by a discussion session between the presenter and partners. The socialization atmosphere is as in Figure 2.



FIGURE 2. Atmosphere of Presentation of Material during Socialization

Providing outreach before making silage for training partners was reported to be able to increase knowledge and skills in making silage feed (Christi *et al.*, 2021). Apart from that, providing socialization for partners can provide opportunities for partners to interact with presenters about the material that has been presented (Kleden & Nenobais, 2018).

The process of chopping forage materials

Forage choppers have several purposes, including: Helping livestock digestion, reducing the risk of livestock being picky about food, preventing bloating in livestock, extending shelf life, making the feed mixing process easier. The atmosphere of the forage material chopping process is as in Figure 3.



FIGURE 3. Forage material chopping process

The forage chopper can be used to chop various types of animal feed grass, such as elephant grass, odot, pakchong, raja, and kolonjono. Chopping can be done using a forage chopper machine. This machine can help farmers in the chopping process and help livestock digest.

Demonstration of Silage Making by the Speaker

A demonstration of silage making was carried out by the speaker. The demonstration aims to provide an example for partners before carrying out independent practice in making silage. The demonstration begins with chopping up the forage and then continues with putting the feed ingredients into a container to be compacted. The next step is to weigh the concentrate and then mix it until it is evenly distributed over the chopped forage. Forage that has been mixed with concentrate is then added EM-4 then mix again until evenly mixed. After everything is mixed evenly, it is then put into the silo. The results of the silage making demonstration showed that the participants paid close attention to the steps in making silage demonstrated by the presenter. The atmosphere of the demonstration is as in Figure 3.



FIGURE 4. Demonstration of Silage Making by the Presenter

Previous PkM activities reported that demonstrations of the application of silage technology could increase partners' knowledge and skills in overcoming feed shortages (Tahuk & Bira, 2021). Providing silage making training for partners can increase the knowledge, skills, and abilities of partners in managing forage for their livestock to overcome the problem of feed shortages that are always faced every year (Harjono *et al.*, 2022).

Practice Independent Silage Making by Partners

Practice Making silage independently by partners is carried out with the aim of training and honing partners' skills in making silage independently. The demonstration begins with chopping up the forage then continues with putting the feed ingredients into a container to be compacted. The next step is to weigh the concentrate and then mix it until it is evenly distributed over the chopped forage. The forage that has been mixed with concentrate is then added with EM4 and then mixed again until evenly distributed. After everything is mixed evenly, then put it into the silo. Observation result practice Making silage independently shows that students and livestock groups are skilled in making silage independently as shown in Figure 5.



Figure 5. Partners make silage independently

The results of practice making silage in this PkM is the same as what was reported in previous PkM activities that participants involved in making silage feed felt confident that the technology of preserving forage in the form of silage could be put into practice to overcome the problem of feed shortages during the dry season (Jelantik *et al.*, 2021). Apart from that, independent training enables partners to independently manage forage for ruminant livestock through silage technology (Fadliana *et al.*, 2021).

CONCLUSIONS AND RECOMMENDATIONS

Implementation of this community service activity using socialization methods, demonstrations by presenters, and independent practice of making silage by partners can increase the knowledge and skills of ruminant livestock groups. This can be observed from the knowledge and skills of livestock groups as partners in making silage, which was only 32.67% before counseling and training to 90% after socialization, demonstrations by presenters, and independent practice of making silage. Apart from that, students and livestock groups were very enthusiastic in participating in this community service activity. The enthusiasm of the students and ruminant livestock groups was observed from their seriousness in listening to the socialization, demonstrations by the presenters, and their independent practice of making silage. Based on the results of this community service, the following suggestions can be given: (1) Priority silage making training for target groups whose dry season is longer than the rainy season; (2) The feed ingredients used in the silage making training come from local feed which is commonly used by local communities as animal feed; and (3) The training does not only involve making silage but also must reach the level of evaluating the nutritional content of the silage.

THANK-YOU NOTE

1. Ministry of Education and Culture Research, Technology and Higher Education (DRTPM) as a community service fund provider (PkM) in 2024.
2. LLDIKTI region XV which helps facilitate and distribute community service funds (PkM) in 2024.
3. Flores Bajawa Agricultural College
4. LPPM Flores Bajawa Agricultural College

5. Government, BPD, community leaders, and youth of West Lengkosambi Village, Riung District, Ngada Regency
6. Goat Breeders Group, West Lengkosambi Village, Riung District, Ngada Regency.

REFERENCES

- Abrar, A., Fariyani, A., & Fatonah. (2019). Pengaruh Proporsi Bagian Tanaman Terhadap Kualitas Fisik Silase Rumput Gajah (*Pennisetum Purpureum*). *Jurnal Peternakan Sriwijaya*, 8(1), 21–27.
- Adli, D. N., Sjojfan, O., & Mashudi, M. (2017). Dried of Poultry Waste Urea-Molasses Block (DPW-UMB) as Potential for Feed Supplementation. *Jurnal Agripet*, 17(2), 144–149. <https://doi.org/10.17969/agripet.v17i2.8391>
- Aisyah, S. N., Ali, U., & Kalsum, U. (2022). Potensi Pengembangan Usaha Ternak Sapi Perah Desa Kemiri Kecamatan Jabung Jawa Timur. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, 24 (2), 171–179. <https://doi.org/10.25077/jpi.24.2.171-179.2022>
- Asminaya, N. S., Libriani, R., Nara, P., & Prasanjaya, K. (2021). Optimalisasi Penyediaan Pakan Ternak Melalui Teknologi Pengolahan Pakan Menjadi Silase sebagai Solusi Ketersediaan Pakan Hijauan di Musim Kemarau Bagi Peternak di Kota Kendari. *Media Kontak Tani Ternak*, 3(4), 126–130.
- Bahrin, B., Subagyo, Y., & Astuti, T. Y. (2020). Pembuatan Silase dengan Memanfaatkan Bahan Pakan Lokal Sebagai Upaya Peningkatan Produksi Susu Sapi Perah. *LOGISTA-Jurnal Ilmiah Pengabdian Masyarakat*, 4 (2), 595–603.
- Belanger, J., dan Bredesen, S.T. 2018. *Storey's Guide to Raising Dairy Goats Fifth Edition*. Storey Publishing. North Adams.
- Bira, G. F., Tahuk, P. K., & Gumelar, A. I. (2021). Pelatihan Pembuatan Silase Komplit di Kelompok Wanita Tani (KWT) Mawar Desa Kuaken Kabupaten TTU-NTT. *JPP IPTEK (Jurnal Pengabdian Dan Penerapan IPTEK)*, 5(2), 69–79. <https://doi.org/10.31284/j.jpp-iptek.2021.v5i2.1934>
- Borreani, G., Tabacco, E., Schmidt, R. J., Holmes, B. J., & Muck, R. E. (2018). Silage review: Factors affecting Dry Matter and Quality Losses in Silages. *Journal of Dairy Science*, 101(5), 3952–3979. <https://doi.org/10.3168/jds.2017-13837>
- Christi, R. F., Setyatwan, H., Ismiraj, M. R., Mutaqin, B. K., & Yuniarti, E. (2021). Pembuatan Pakan Silase di Kelompok Ternak Roudhatul Ghonam Kecamatan Sidamulih Kabupaten Pangandaran. *Farmers: Journal of Community Services*, 2(2), 63–67. <https://doi.org/10.24198/fjcs.v2i2.34590>
- Damayanti, N. A., Pusparini, M., Djannatun, T., & Ferlianti, R. (2017). Metode Pre-Test dan Post-Test Sebagai Salah Satu Alat Ukur Keberhasilan Kegiatan Penyuluhan Kesehatan Tentang Tuberkulosis di Kelurahan Utan Panjang, Jakarta Pusat. *Prosiding SNaPP2017 Kesehatan*, 3(1), 144–150.
- Fadliana, A., Choirina, P., Tjiptady, B. C., Fitriani, I. M., & Pradhana, C. (2021). Preservasi Pakan dengan Teknologi Ensilase untuk Optimalisasi Ketersediaan Bahan Pakan Ternak Hijauan di Desa Ngasem Kecamatan Ngajum Kabupaten Malang. *I-Com: Indonesian Community Journal*, 1(1), 24–34. <https://doi.org/10.33379/icom.v1i1.957>,
- Sutaryono, Y. A., Mastur, Dahlanuddin, & Sukarne. (2022). Pelatihan Pembuatan Silase dengan Aditif Stimulan Bakteri as. Laktat di Kelompok Ternak Sapi Tunas Karya Desa Teruwai Pujut Lombok Tengah. *Jurnal Pengabdian Magister Pendidikan IPA*, 5(4), 41–45. <https://doi.org/10.29303/jpmpi.v5i4.2369>
- Jaelani, A., Gunawan, A., & Asriani, I. (2014). The effect of Storage Length Palm Leaf Silage to Crude Protein and Crude Fiber. *Ziraa'Ah*, 39(1), 8–16.
- Jelantik, I. G. N., Dato, I. B., Dami, T. O., Oematan, G., Jalaluddin, Tolupere, F. F., Luruk, M. Y., & Niron, S. (2021). Pelatihan Pembuatan Silase Hijauan di Kelompok Tani-Ternak Ora Et Labora Kelurahan Naioni Kota Kupang. *Jurnal Pemberdayaan Masyarakat Petani Vol*, 3(2), 436–444.
- Kleden, M. M., & Nenobais, M. (2018). Upaya Pendayagunaan Limbah Pertanian sebagai Pakan Unggulan Musim Kemarau di Lahan Kering. *JPM (Jurnal Pemberdayaan Masyarakat)*, 3(1), 213–221. <https://doi.org/10.21067/jpm.v3i1.2656>
- Kleden, M. M., Ratu, M. R., & Randu, M. D. (2015). Kapasitas Tampung Hijauan Pakan dalam Areal Perkebunan Kopi dan Padang Rumput Alam di Kabupaten Flores Timur Nusa Tenggara Timur. *Zootec*, 35(2), 340–351. <https://doi.org/10.35792/zot.35.2.2015.9274>
- Manu, A. E. (2014). Produktivitas Padang Penggembalaan Sabana Timor Barat. *Pastura: Journal of Tropical Forage Science*, 3(1), 25–29.

- Nurdin, Fitriah S. Jamin, Siswatiana R. Taha, Agustinus Moonti, R. R. (2020). Peningkatan Pengetahuan dan Keterampilan Petani dalam Pembuatan Pakan Silase di Kelompok Tani Rukun Sejahtera Desa Bualo Kabupaten Boalemo. *Jurnal Abdi Insani Universitas Mataram*, 7(2), 225–234.
- Nurlaha, N., Setiana, A., & Asminaya, N. S. (2015). Identifikasi Jenis Hijauan Makanan Ternak di Lahan Persawahan Desa Babakan Kecamatan Dramaga Kabupaten Bogor. *Jurnal Ilmu Dan Teknologi Peternakan Tropis*, 1(1), 54–62. <https://doi.org/10.33772/jitro.v1i1.361>
- Onesimus, Y., Supriyanto, A., Widayati, T., & Sumpe, I. (2015). Komposisi Botani dan Persebaran Jenis-Jenis Hijauan Lokal Padang Pengembalaan Alam di Papua Barat. *Pastura*, 4(2), 62–65.
- Patriani, P., Ginting, N., Hasanah, U., & Mirwandhono, R. E. (2019). Application of Silase Waste Fruit Leather Technology in Suka Village, Kecamatan Tigapanah, Karo District. *Abdimas Talenta: Jurnal Pengabdian Kepada Masyarakat*, 4(2), 192–199. <https://doi.org/10.32734/abdimastalenta.v4i2.3669>
- Prasetyo, T. B. (2019). Pembuatan Pakan Ternak Fermentasi (Silase). *SWADAYA: Indonesian Journal of Community Empowerment*, 1(1), 48–54.
- Qasim, M. (2016). Kegiatan Pembelajaran. *Jurnal Diskursus Islam*, 04(3), 484–492.
- Ramdhan, B., Suhendar, & Astuningsih, E. T. (2016). Ketahanan Pakan Melalui Silase untuk Ternak Domba di Kecamatan Takokak, Kabupaten Cianjur. *Agrokreatif Jurnal Ilmiah Pengabdian Kepada Masyarakat*, 2(1), 39–46.
- Saelan, E., & Lestari, S. (2021). Pelatihan Pembuatan Silase untuk Pakan Ternak Ruminansia Kecamatan Oba Tengah Kota Tidore Kepulauan. *Media Kontak Tani Ternak*, 3(3), 64–71. <https://doi.org/10.24198/mktt.v3i3.34615>
- Sahala, J., Sio, A. K., Banu, M., Feka, W. V., Kolo, Y., I, A., & Manalu. (2022). Penyuluhan Pembuatan Silase Sebagai Pakan Ternak Sapi Potong di Desa Fatuneno Kecamatan Miomaffo Barat Kabupaten Timor Tengah Utara. *Amaliah: Jurnal Pengabdian Kepada Masyarakat Volume*, 6(2), 317–321.
- Supriadi, S. (2015). Implementasi Inovasi Teknologi Sistem Penyediaan Hijauan Makanan Ternak di Lahan Kering di Yogyakarta. *Planta Tropika: Journal of Agro Science*, 3(2), 107–113. <https://doi.org/10.18196/pt.2015.047.107-113>
- Suryaningsih, Y. (2022). Penerapan Teknologi Silase untuk Mengatasi Keterbatasan Hijauan Pakan Ternak Pada Musim Kemarau di Desa Arjasa Kecamatan Arjasa Kabupaten Situbondo. *Mimbar Intergritas: Jurnal Pengabdian*, 1(2), 279–289.
- Suyasa, N., Budiari, N. L. G., & Parwati, I. A. (2017). Memanfaatkan Ketersediaan Hijauan Pakan Ternak (HPT) dalam Berbagai Komposisi Pakan untuk Menjaga Produktivitas Sapi Bali (Studi Kasus Di Desa Belanga, Bangli). *Pastura*, 5(2), 109–113. <https://doi.org/10.24843/pastura.2016.v05.i02.p10>
- Tahuk, P. K., & Bira, G. F. (2021). Pelatihan Pembuatan Silase Gamal (*Gliricida Sepium*) dalam Mengatasi Kekurangan Pakan di Desa Kuaken Kecamatan Noemuti Timur Kabupaten TTU. *Jurnal Pengabdian Masyarakat*, 04(01), 44–51.