JAPSI (Journal of Agriprecision and Social Impact)
Volume 1 Issue 3 November 2024
e-ISSN: 3032-7849; p-ISSN: 3046-5397, Page 231-243
DOI: 10.62793/japsi.v1i3.31
Available online at: https://journal.kdp.co.id/index.php/japsi

Forage Plant Species and Pasture Capacity in Post Coal Mine Land, Margahayu Village, Kutai Kartanegara Regency

Muhammad Ubaidillah
Department of Animal Husbandry, Faculty of Agriculture, Mulawarman University

Taufan Purwokusumaning Daru
Department af Animal Husbandry, Faculty of Agriculture, Mulawarman University

Nurul Fajrih
Department of Animal Husbandry, Faculty of Agriculture, Mulawarman University

Apdila Safitri
Department of Animal Husbandry, Faculty of Agriculture, Mulawarman University

Address: Pasir Balengkong Street, Samarinda, East Kalimantan
Corresponding author: taufan@faperta.unmul.ac.id

Abstract*. Margahayu Village is one of the villages located in Loa Kulu Sub-district, Kutai Kartanegara Regency, which is a coal mining area. The post-coal mine reclamation land is mostly utilized by the local community as a Bali cattle pasture. In order for the pasture to be sustainable, it is necessary to know information about the type of forage plant and the carrying capacity of the pasture. This study aims to determine the types of forage plants that grow naturally and the carrying capacity of the pasture in Margahayu Village, Kutai Kartanegara Regency. The method used in this research is the exploratory method, by taking a snapshot using a quadrant size of 1 m x 1 m as many as 20 quadrants. The results showed that the pasture in post-mining land, Margahayu Village obtained 26 different species from 13 families. The dominant forage plant species in the pasture of Margahayu Village is Paspalum conjugatum with an IVI of 98.4% and a carrying capacity of 2.57 AU* ha^{-1} $year^{-1}$*. The pastures in Margahayu Village can still accommodate 667.06 AU or equivalent to 667 cows.*

Keywords: *Carrying capacity, Forage plants, IVI, Margahayu village, Pasture*

Received: August 16, 2024; Accepted: September 23, 2024; Published: November 5, 2024
*Corresponding author taufan@faperta@unmul.ac.id

INTRODUCTION

Margahayu Village is one of the villages in Loa Kulu District, Kutai Kartanegara Regency, East Kalimantan. Margahayu village has an area of 8,500 ha. The village is one of the coal mining areas with more than 300 ha of reclaimed land. The people of Margahayu Village utilize the reclaimed post-mining land as a pasture for livestock, especially Bali cattle. The utilization of post-mining reclamation land as pasture by farmers in Margahayu Village has a positive impact on the development of the Balinese cattle population. Pastures on post-mining land in Margahayu Village have the potential to play an important role in providing feed for Bali cattle.

Several previous studies have examined the utilization of post-mining land for livestock activities. Grasses and shrubs that grow on post-coal mining land in Kutai Kartanegara Regency are considered potential to support ruminant livestock (Daru et al., 2020). Strategic factors that need to be considered in developing beef cattle farming on sustainable post-coal mining land for the ecological dimension include soil fertility, feed carrying capacity, and grazing pressure (Daru et al., 2016).

The pastures on post-coal mine land in Margahayu Village do not yet have information on the types of forage plants that grow naturally and estimates of the carrying capacity of the pastures. This is important to prevent overgrazing or undergrazing. In addition, it is necessary to anticipate the sustainability of the pasture. Thus, in this study, we identified the types of forage plants that grow in the pasture of post-coal mine reclamation land and estimated the carrying capacity of the pasture.

LITERATURE REVIEW

Pasture is a land where forage plants grow that are available to livestock and can feed livestock in a short time according to their needs. Pastures consist of grasses and legumes, but pastures consisting of a mixture of grasses and legumes have economic value (Marta, 2015). Pastures are highly relied upon for their potential as fodder barns (Hambakodu, 2021). Good pastures have forages with high fresh and dry matter production, and the absence of weeds (Hambakodu, 2023).

Pasture vegetation is a collection of various types of plants that grow in a certain area consisting of natural grasses, legumes, and weeds (Hambakodu, 2023). Grasses are a source of crude fiber for livestock while legumes are a source of protein for livestock

because of the crude protein content above 18% that legumes generally have (Suherman & Herdiawan, 2015). Both groups act as a source of nutrition and satiety for livestock.

Forage production is the amount of forage produced by pastures in the form of both fresh and dry matter (Hambakodu, 2021). Fresh matter production is the weight of forage produced in fresh form while fresh weight production is the weight of forage produced in dry matter (Hambakodu, 2023). Some factors that affect the low production of pasture forage in the dry season are the age of the forage which is getting old and most of it dies, then in the dry season the proportion of legumes is less and weeds are more, another factor is the locust pests that attack the forage, causing the yield of forage feed to decrease.

IVI (Important Value Index) is an index calculated based on the amount obtained to determine the level of dominance of species in a plant community (Havid Parmadi et al., 2016). IVI is obtained from the sum of relative density and relative frequency (Daru et al., 2023). The higher the IVI value of a species, the species can be indicated to have good adaptation, competition and reproduction compared to other plants on the same land (Zulkarnain et al., 2015).

Carrying capacity is the ability of a pasture to produce forage needed by a certain number of livestock grazing on a certain unit area (Hae et al., 2020a). The carrying capacity of ruminants in an area indicates the maximum number of beef cattle that can be kept in the area based on the availability of forage feed.

RESEARCH METHODS

This research was conducted in Block C Pasture (Sumber Rejeki Livestock Group), Margahayu Village, Loa Kulu District, Kutai Kartanegara Regency. Data collection was conducted from January to February 2024. The tools used were grass clippers, plastic bags, scissors, digital scales, sitting scales, cameras, calculators, and 1 m x 1 m quadrants. The method used in this research is the exploratory method, which is observing plant vegetation in the pasture of Margahayu Village, Kutai Kartanegara Regency.

Procedures

1. Identification of Forage Plants

In the identification of forage plant species, the method used is the random sampling method using a 1 m × 1 m quadrant. The number of plots taken was 20 plots on a 10 ha land size. Determination of the 10-hectare land area was measured using the GPS Field Area Measure application. Determination of the location of the snapshot was carried out

by walking from one point to another in the North, South, East, and West directions by randomly throwing the quadrant tool on the land area of 20 snapshot points.

Identification was done visually and with the help of PictureThis, PlantApp, and Google Lens applications. Plants found were then photographed and entered into the application one by one according to the type of plant found in one plot based on local and scientific names.

2. Calculating IVI Value

As for calculating the IVI value, the formula used is:

$$\text{IVI} = \text{Relative Density (RD)} + \text{Relative Frequency (RF)}$$ (Daru et al., 2023)

a. Density $= \frac{\text{Number of species individuals}}{\text{Plot area}}$

b. Relative density $= \frac{\text{Density of a species}}{\text{Total density of all species}} \times 100\%$

c. Frequency $= \frac{\text{Number of plots found on a species}}{\text{Total of all plots}}$

d. Relative frequency $= \frac{\text{Frequency of a species}}{\text{Total frequency of all species}} \times 100\%$

The IVI formula is by adding relative density and relative frequency. The calculation of the formula begins with finding the density and frequency of each species, for the density formula of one species is the number of individuals divided by the sample plot area, for the frequency formula is the number of observation plots found by a species divided by all observation plots. The formula for finding relative density is the density of one type of plant individual divided by the total density of all types then multiplied by 100%. While the relative frequency is formulated by the frequency of one species divided by the total frequency of all species then multiplied by 100%.

3. Forage Production and Carrying Capacity

Measurement of forage fresh matter production was carried out using a 1 m × 1 m quadrant frame by throwing 20 plots on 10 hectares of land. The forage in the plot was then mowed to weigh the fresh weight. After weighing, the grass was aerated to find its dry weight. Forage fresh matter production per m2 was calculated using the Proper Use Factor (PUF) as a consideration that not all forage is available to livestock because some must be left for regrowth purposes with the formula:

$$\text{P} = \text{sample weight (g m}^{-2}) \times \%\text{PUF}$$ (Widiyana et al., 2023)

Description:

P = Forage production

PUF = PUF is set at 45% assuming moderate grazing.

To find out the available forage production, you can use the formula:

$$\text{Available forage production} = \frac{\text{Forage production}}{1000} \times 10.000$$

Determining the fresh material requirement per day for livestock with 5 - 10% body weight. The needs of adult cattle are assumed to be 200 kg with a fresh matter requirement of 10%, so the daily livestock requirement is 20 kg.

$$\text{Feed intake} = 10\% \times \text{body weight (Kg)} \text{ (Daru et al., 2014)}$$

After forage production data is available and the value of livestock needs per day is obtained, then determine the need for land area per month (ha) with the formula:

$$\text{Land area requirement per month} = \frac{\text{Feed intake x 30 days}}{\text{Available forage production}}$$

To calculate the total carrying capacity of pastures in Margahayu Village, the voisin equation is used. The equation is:

$$(y - 1)\, s = r \text{ (Hambakodu, 2021c)}$$

Description:

y = The smallest number of units of land area required by a cow

s = Grazing period

r = Rest period for plants to grow again

To calculate the land area requirement per year, the formula is used:

$$\text{Land area requirement per year} = Y \text{ x Land area requirement per month}$$

To obtain the carrying capacity using the formula:

$$\text{Carrying capacity} = \frac{1}{\text{Land area requirement per year}} \text{ (Widiyana et al., 2023)}$$

RESULTS AND DISCUSSION

1. Overview of the Research Location

Margahayu Village is one of the villages in Loa Kulu Sub-district, Kutai Kartanegara Regency, East Kalimantan. Margahayu Village is located at coordinates 116.768413 West and -0.53062 South. The Margahayu Village area is bordered by Loa Ipuh Darat village in the north, Jonggon Jaya in the south, Sungai Payang in the east, and Benua Baru in the west. From the city of Tenggarong to Margahayu Village is 30 km and takes about 40 to 44 minutes. Meanwhile, from the provincial capital or Samarinda to Margahayu Village is 60 km and takes about 1 hour and 30 minutes (Fahlevi et al., 2022). The village is at an altitude of about 300 meters above sea level, with 165,124 mm of rainfall per year, and an air temperature of 20-30 degrees Celsius (Fahlevi et al., 2022).

Margahayu Village has an area of approximately 8,523 hectares, most of which is dominated by rice fields, plantations, forests, and livestock. Margahayu village itself has a population of 3,786 people and the majority work as farmers and breeders who join several farmer groups consisting of 16 farmer groups and 5 cattle groups. The cattle groups have a total of 1,400 Balinese cattle. Margahayu village itself is in a coal mining area so some areas are post-mining land areas.

The existence of Balinese cattle farming in Margahayu Village began with assistance from the provincial government in 2012 in the form of 13 females with 2 male Balinese cows, and then in 2013 the district government helped Margahayu Village farmers in the form of 10 females and 2 male Balinese cows. Farmers feel overwhelmed by the number of cows if kept at home and the difficulty of finding grass for cattle feed needs during the dry season, so in 2014 the livestock group administrators began to contact the management of PT Multi Harapan Utama as the landowner to utilize the post-mining land. Then the two parties held deliberations with the results of the division of areas in each livestock group based on voids and assistance in the form of barbed wire fences.

Bali cattle grazing on post-mining land in Margahayu Village use an extensive grazing system. Extensive farming can be defined as a model of livestock rearing by releasing livestock to graze freely in the wild or crops that are not used for agricultural purposes (Lase et al., 2021). Farmers release their livestock on land without providing cages. Farmers only monitor their livestock in the afternoon and at night so that the

livestock do not move to the road. The extensive grazing system practiced by farmers has a positive impact. The population of Balinese cattle has increased from 27 cattle in 2014 to 188 cattle in 2024, with each year farmers can sell their cattle according to their needs. Figure 1 shows the location of the pastureland in Margahayu Village.

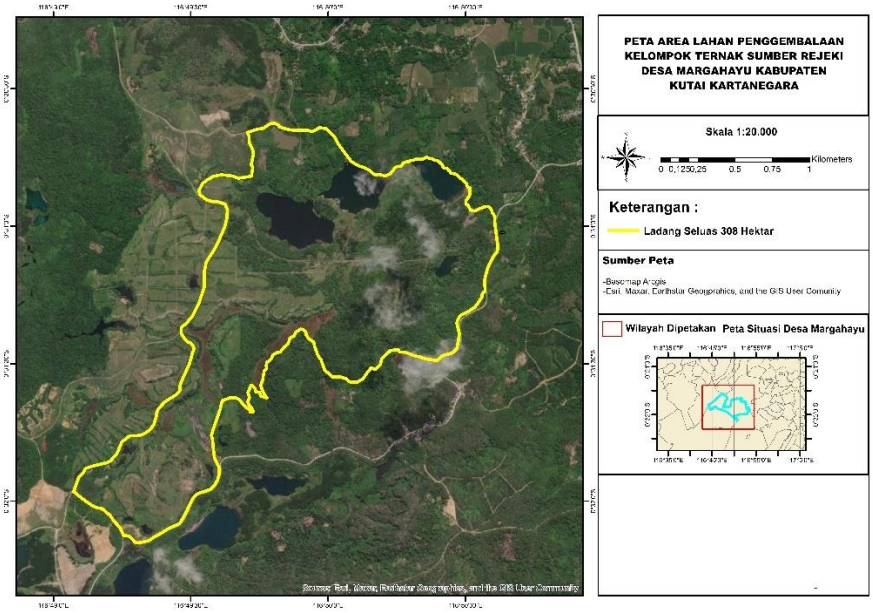

Figure 1. Location of Margahayu Village pasture land

2. Identification of Forage Plants

Identification of plant species is done by observing the types of plants that grow in each snippet that is thrown randomly 20 times. Based on the identification results, 26 plant species were obtained, which can be seen in Table 1.

Table 1. Plant vegetation types in the pasture of post-mining reclamation land, Margahayu Village, Kutai Kartanegara Regency.

NO	Vegetation Type		
	Local Name	Scientific Name	Family
1	Rumput kerbau	Paspalum conjugatum	Poaceae
2	Alang-alang	Imperata cylindrica	Poaceae
3	-	Fimbristylis littoralis	Cyperaceae
4	Putri malu	Mimosa pudica	Fabaceae
5	-	Evolvulus nummularius	Convolvulaceae
6	-	Juncus effusus	Juncaceae
7	Sisik betok	Desmodium triflorum	Fabaceae
8	-	Paspalum dilatatum	Poaceae
9	Rumput knop	Hyptis capitata	Lamiaceae
10	Sentro	Centrosema pubescens	Fabaceae

11	Brobos	Alysicarpus vaginalis	Fabaceae
12	-	Desmodium barbatum	Fabaceae
13	Harendong	Melastoma malabatricum	Melastomataceae
14	-	Festuca filiformis	Poaceae
15	-	Rhynchospora berteroi	Cyperaceae
16	Pakis	Cristella dentata	Thelypteridaceae
17	Rumput minjangan	Chromolaena odorata	Asteraceae
18	-	Cyperus polystachyos	Cyperaceae
19	Ketepeng	Senna	Fabaceae
20	Salam koja	Murraya koenigii	Rutaceae
21	Terompet kuning	Tecoma stans	Bignoniaceae
22	Senduduk bulu	Clidemia hirta	Melastomataceae
23	-	Lygodium microphyllum	Lygodiaceae
24	-	Acrostichum aureum	Polypodiaceae
25	Sembung rambat	Mikania micrantha	Asteraceae
26	-	Desmodium heterocarpon	Fabaceae

Based on the results of plant species identification research conducted in the pastureland of Margahayu Village, 26 plant species from 13 families were found, namely Lamiaceae, Thelypteridaceae, Asteraceae, Fabaceae, Poaceae, Melastomataceae, Cyperaceae, Rutaceae, Convolvulaceae, Lygodiaceae, Polypodiaceae, Juncaceae, and Bignoniaceae.

3. Important Value Index

IVI is an index calculated based on the number obtained to determine the dominance of a species in a plant community, calculated from the total relative density and relative frequency. The high index of importance of a species in a plant community indicates that the species suppresses the growth of other species that occupy the same space (Daru et al., 2023).

Table 2. IVI value

NO	Scientific Name	Eaten by Cattle*	RD (%)	RF (%)	IVI (%)
1	Paspalum conjugatum	+	75	23.4	98.4
2	Imperata cylindrica	+	8.86	7.79	16.7
3	Mimosa pudica	+	2.05	14.3	16.3
4	Fimbristylis littoralis	+	7.07	1.3	8.37
5	Centrosema pubescens	+	0.52	7.79	8.32
6	Alysicarpus vaginalis	-	0.52	6.49	7.02
7	Hyptis capitata	-	0.52	5.19	5.72
8	Desmodium triflorum	+	0.65	3.9	4.55

9	Melastoma malabatricum	-	0.22	3.9	4.11
10	Chromolaena odorata	-	0.13	3.9	4.03
11	Murraya koenigii	-	0.09	2.6	2.68
12	Evolvulus nummularius	-	1.27	1.3	2.56
13	Juncus effusus	-	0.96	1.3	2.26
14	Paspalum dilatatum	+	0.61	1.3	1.91
15	Desmodium barbatum	+	0.39	1.3	1.69
16	Festuca filiformis	-	0.22	1.3	1.52
17	Rhynchospora berteroi	+	0.22	1.3	1.52
18	Cristella dentata	-	0.17	1.3	1.47
19	Cyperus polystachyos	-	0.13	1.3	1.43
20	Senna	+	0.09	1.3	1.39
21	Tecoma stans	+	0.09	1.3	1.39
22	Clidemia hirta	-	0.04	1.3	1.34
23	Lygodium microphyllum	-	0.04	1.3	1.34
24	Acrostichum aureum	-	0.04	1.3	1.34
25	Mikania micrantha	+	0.04	1.3	1.34
26	Desmodium heterocarpon	+	0.04	1.3	1.34

Description: RD: Relative Density; RF : Relative Frequency; *Source: (Daru et al., 2023); (Hadan et al., 2023); (Ngawit & Farida, 2022)

Based on Table 2, Paspalum conjugatum stands out as the plant with the highest number of individuals. One of the main factors causing the dominance of Paspalum conjugatum grass is its resistance to existing environmental conditions. This type of plant is a plant that easily lives in an environment that is poor in nutrients and high in lighting (Daru et al., 2020). In addition, this plant can absorb heavy metals in the soil and has a high level of adaptation (Munawarah & Wiryono, 2017).

In this study, results were found in line with previous research on post-coal mine reclamation land, where similar findings on the highest number of individuals were found in Paspalum conjugatum plants (Daru et al., 2020). This shows that Paspalum conjugatum plants have good adaptability in post-coal mine reclamation land.

Based on the results of the vegetation analysis conducted, Table 2 shows that Paspalum conjugatum plants have the highest IVI value of 98.4%, followed by Imperata cylindrica with 16.7%, Mimosa pudica with 16.3%, Fimbristylis littoralis with 8.37%, and Centrosema pubescens with 8.32%. These results indicate that Paspalum conjugatum plants are adaptive to growing on post-coal mine reclamation land supported by open land conditions and sunlight that directly reaches the plants, which in turn accelerates the photosynthesis process. Daru et al. (2020) mentioned that Paspalum conjugatum grass

has a high level of tolerance to environmental factors, especially light and soil (Daru et al., 2020). Soerianegara and Indrawan (2008) in Adib Setiawan et al (2017) mention that Paspalum conjugatum can thrive on mining soil characters that tend to be nutrient poor and dry (Adib Setiawan et al., 2017).

Imperata cylindrica is the plant species with the second highest IVI value after Paspalum conjugatum. Imperata cylindrica or alang-alang belongs to the Poaceae family. These plants are adaptive to dry environments, grow quickly in open areas with abundant sunlight, and are invasive. Its proliferation is fast because its light seeds are easily carried by the wind. Almost all dominant plants are commonly eaten by livestock. The dominant plants belong to the Poaceae, Fabaceae, and Cyperaceae families. Asep (2010) in Hadan et al. (2023) stated that all types of poaceae are palatable for ruminants (Hadan et al., 2023).

4. Carrying Capacity

Capacity is the ability of the pasture to produce fodder according to the number of livestock grazed per hectare. The results of the capacity calculation are presented in Table 3.

Table 3. Forage Production and Carrying Capacity

Sample	Forage Production		Feed Intake	Land area requirement per month	Period (days)		voisin	Land area requirement per year	CC
	PUF 45% (g m^{-2})	FF (kg ha^{-1})	(Kg^{-1} $head^{1}$ day^{-1})	(ha^{-1} $head^{1}$ $month^{-1}$)	*stay*	*rest*		(ha^{-1} $year^{-1}$)	(ha^{-1} $year^{-1}$)
Forage	509,63	5096,25	20	0,12	30	70	3,3	0,39	2,57

Description: PUF: Proper Use Factor; FF : Fresh Feed ; CC : Carrying Capacity * Assumed body weight 200 kg

Grazing capacity, also known as carrying capacity, indicates how many livestock can be supported on a pasture without compromising available resources, such as crops and soil. Some factors that are strongly influenced by grazing capacity include slope, distance to water sources, and shade. Grazing capacity will continue to decrease as the distance from water sources increases, the slope steepens, and the plant canopy in the pasture increases (Hae et al., 2020b). In addition, it is explained that if the slope is between 30 and 60%, the grazing capacity will be reduced by 60%. Whereas if the slope exceeds 60%, the grazing capacity will be completely reduced to 100%.

The results showed that the Margahayu Village pasture has a capacity value of 2.57 AU ha^{-1} $year^{-1}$, or equivalent to two adult cows and two calves per hectare per year. This shows that the pasture of Margahayu Village is classified as high. The higher the unit

value of livestock per hectare in a pasture, the better the pasture can accommodate livestock, while the lower the density of livestock per hectare, the less adequate the pasture will be to accommodate livestock (Tarapanjang et al., 2022).

When compared to the ratio between the capacity of cattle in the pastures of Margahayu Village of 2.57 AU ha^{-1} $year^{-1}$ with a pasture area of about 308 hectares and the number of livestock belonging to the Sumber Rejeki livestock group, which is 188 heads or equivalent to 124.5 AU, then this figure states that the level of livestock density in the pastures is still low.

Margahayu Village pasture (Block C) has an area of about 308 ha and a capacity value of 2.57 AU, which can accommodate 791.56 AU of livestock. Margahayu Village pasture (Block C) can still accommodate 667.06 AU to utilize the available land, thus the potential of Margahayu Village pasture is still quite large compared to the current number of livestock.

CONCLUSION

The results of research in post-mining reclamation land pastures in Margahayu Village found 26 types of plant vegetation from 13 families. Based on IVI, the dominant plant species in the pasture of Margahayu Village is Paspalum conjugatum, which has the highest IVI of 98.4%. Margahayu Village pasture has a storage capacity of 2.57 AU ha^{-1} $year^{-1}$. Margahayu Village pasture (Block C) can still accommodate 667.06 AU or equivalent to 667 cows.

REFERENCES

Adib Setiawan, K., Sutedjo, & Matius, P. (2017). Komposisi Jenis Tumbuhan Bawah di Lahan Revegetasi Pasca Tambang Batubara. *Ulin-J Hut Trop*, *1*(2), 182–195.

Daru, T. P., Sunaryo, W., Pagoray, H., Suhardi, Mayulu, H., Ibrahim, & Safitri, A. (2023). Diversity, nutrient contents and production of forage plants in an integrated cattle livestock-oil palm plantation in East Kalimantan, Indonesia. *Biodiversitas*, *24*(4), 1980–1988. https://doi.org/10.13057/biodiv/d240406

Daru, T. P., Yulianti, A., & Widodo, E. (2014). *Potensi Hijauan Di Perkebunan Kelapa Sawit Sebagai Pakan Sapi Potong DI Kabupaten Kutai Kartanegara*. https://doi.org/https://doi.org/10.24843/Pastura.2014.v03.i02.p09

Daru, T. P., Yusuf, R., & Juraemi, J. (2020). Potensi Tumbuhan di Lahan Reklamasi Pasca Tambang Batubara Sebagai Pakan Ternak. *Jurnal Pertanian Terpadu*, *8*(2), 164–174. https://doi.org/10.36084/jpt..v8i2.273

Fahlevi, M. R., Burhanuddin, & Muhammad Fitrah. (2022). Pengelolaan Sumber Daya Alam atau Potensi Dengan Pembuatan Website dan Video Profil Desa. *Dinamisia : Jurnal Pengabdian Kepada Masyarakat*, *6*(5), 1148–1154. https://doi.org/10.31849/dinamisia.v6i5.10380

Hadan, E. W., Bahri, S., & Mukhtar, M. (2023). Keanekaragaman dan Produksi Biomas Rumput di Bawah Tanaman Padi Sebagai Pakan Ternak Sapi Potong di Kecamatan Tilongkabila. *Jambura Journal Of Tropical Livestock Studies (e-ISSN: Xxxx-Xxxx)*, *1*(1), 32–37.

Hae, V. H., Kleden, M. M., & Tany Temu, S. (2020a). Produksi, Komposisi Botani dan Kapasitas Tampung Hijauan Pada Padang Penggembalaan Alam Awal Musim Kemarau. *Jurnal Nukleus Peternakan*, *7*(1), 2656–2792.

Hae, V. H., Kleden, M. M., & Tany Temu, S. (2020b). Produksi, Komposisi Botani dan Kapasitas Tampung Hijauan Pada Padang Penggembalaan Alam Awal Musim Kemarau. *Jurnal Nukleus Peternakan*, *7*(1), 2656–2792.

Hambakodu, M. (2021a). Evaluasi Nilai Nutrisi dan Kecernaan In Vitro Beberapa Rumput Alam dari Lahan Perkebunan dan Padang Penggembalaan. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*, *23*(2), 130. https://doi.org/10.25077/jpi.23.2.130-135.2021

Hambakodu, M. (2021b). *Produksi, komposisi botani dan kapasitas tampung padang penggembalaan alam Kecamatan Haharu Kabupaten Sumba Timur*. 112–117. https://doi.org/10.25047/animpro.2021.14

Hambakodu, M. (2021c). Produksi, komposisi botani dan kapasitas tampung padang penggembalaan alam Kecamatan Haharu Kabupaten Sumba Timur. *ANIMPRO*, *2*. https://doi.org/10.25047/animpro.2021.14

Hambakodu, M. (2023). *Buku Ajar Ekologi Sabana (Padang Penggembalaan Alam dan Lahan Pertanian)* (E. Damayanti, Ed.; 1st ed.). Widina Media Utama.

Havid Parmadi, E. J., Dewiyanti, I., & Karina, S. (2016). Indeks Nilai Penting Vegetasi Mangrove Di Kawasan Kuala Idi, Kabupaten Aceh Timur. *Jurnal Ilmiah Mahasiswa Kelautan Dan Perikanan Unsyiah*, *1*(1), 82–95.

Lase, J. A., Ardiarini, N., & Habeahan, K. B. (2021). *"Membangun Sinergi antar Perguruan Tinggi dan Industri Pertanian dalam Rangka Implementasi Merdeka*

Belajar Kampus Merdeka" Potensi dan Pola Pemeliharaan Sapi Bali di Maluku Utara. *5*(1), 761–771.

Marta, Y. (2015). Sistem Penggembalaan Sebagai Alternatif Peternakan Sapi Potong yang Efektif dan Efisien. *Pastura*, *5*(1), 51–55.

Munawarah, F., & Wiryono, B. (2017). Peranan Fitoremediasi Pada Lahan Bekas Tambang Emas di Kecamatan Jonggat Kabupaten Lombok Tengah. *Jurnal Agrotek Ummat*, *4*(2).

Ngawit, I. K., & Farida, N. (2022). Potential of Weed As Raw Material for Animal Feed on The Integration of Cattle with Coconut Plantations. *Jurnal Penelitian Pendidikan IPA*, *8*(SpecialIssue), 76–86. https://doi.org/10.29303/jppipa.v8iSpecialIssue.2488

Suherman, D., & Herdiawan, I. (2015). Tanaman Legum Pohon Desmodium rensonii Sebagai Tanaman Pakan Ternak Bermutu. *Pastura*, *4*(2), 100–104.

Tarapanjang, A. H., Hambakodu, M., & Denisius, U. P. (2022). Produksi, Komposisi Botani dan Kapasitas Tampung Padang Penggembalaan Desa Lai Ndeha Kecamatan Pandawai Kabupaten Sumba Timur. *Jurnal Peternakan Sabana*, *1*(2). https://ojs.unkriswina.ac.id/index.php/sabana

Daru, T. P., Pagoray, H., & Suhardi. (2016). Pemanfaatan Lahan Pasca Tambang Batubara Sebagai Usaha Peternakan Sapi Potong Berkelanjutan. *ZIRAA'AH*, *41*(3), 382–392. https://www.researchgate.net/publication/345150801

Widiyana, R., Daru, T. P., & Safitri, A. (2023). Identifikasi Jenis Tanaman Pakan Ternak Kerbau Di Pulau Lanting Kabupaten Kutai Barat. *Jurnal Pertanian Terpadu*, *11*(1), 59–72. https://doi.org/https://doi.org/10.36084/jpt..v10i2.381

Zulkarnain, Ode Alimuddin, L., & Razak, A. (2015). Analisis Vegetasi dan Visualisasi Profil Vegetasi Hutan di Ekosistem Hutan Tahura Nipa-Nipa di Kelurahan Mangga Dua Kota Kendari. *Ecogreen*, *1*(1), 43–54.