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Botanical Composition, Percentage and Quality of Cattle Feed Plants in West Sumbawa Regency

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Abstract: This study aims to determine the botanical composition, percentage, and quality of plant feed given to cattle. The research was carried out in West Sumbawa Regency, using a survey method or direct observation in the field with a purposive sampling technique of 50 cattle breeders in Sumbawa Regency. The method used is by weighing the fresh weight of the whole feed given to the cows. Forage plants were observed by separating the plants based on their type, then identified each type of forage plant that has been separated using the help of the Plant Net application and followed by proximate analysis. The results showed that the botanical composition consisted of 19 types of forage plants, namely 6 types of legumes, 4 types of grasses, 2 types of agricultural waste, and 7 types of weeds. The percentage of forage feed respectively is legumes (53%), grass (43%), agricultural waste (3%), and others (1%). Leguminous feed was dominated by lamtoro (46.16%) and other legumes (6.37%). The quality of feed given to cattle is of good quality due to the dominance of forage legumes in feed with a crude protein content of 16.06%.

Keywords: Botanical composition; Forage quality; Leguminous; Plant species

Introduction

Sumbawa Island is one of the areas in Indonesia that has a quite unique tradition of raising cattle. Cows on Sumbawa Island are one of the main sources of income for people in the region. Cattle raising on Sumbawa Island is based on local customs and wisdom passed down from generation to generation.

Sumbawa Island generally uses a rearing system by means of free grazing (Sutaryono et al., 2019). But along with the intensification of the cropping system with the presence of an irrigation system, maintenance has begun to switch to using a cut and carry system in providing animal feed (Dahlanuddin et al., 2016). Even so, the variety of feed given is still very high depending on its availability both by nature and by breeders. Cattle feeding on the island of Sumbawa varies widely, starting from a single feed and a combination of other types of feed such as field grass, cultivated grass, and agricultural waste.

The cattle rearing system at the breeder level is considered to be sub-optimal, because cattle are tied or left in natural grazing areas with low forage quality, because the forage composition of fodder is dominated by natural grass and weeds (Nursan et al., 2021).

Feed quality is one of the determinants of the success of a livestock business. Cattle generally like feed in the form of fresh plants such as grasses, legumes, tubers and agricultural waste (Dilaga et al., 2021). The feed contains nutritional elements whose concentration varies depending on the type, type and condition of the feed. The nutritional elements contained in feed ingredients generally consist of water, minerals, protein, fat, carbohydrates and vitamins. One of the indicators to assess the quality of feed in cattle is to know the composition of the feed plants, the percentage of feed and the quality of the feed given (Mastur et al., 2022).

Based on the description above, the research was conducted to analyze the botanical composition,

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percentage of forage plants, and the quality of the feed given to cattle on the West Sumbawa Regency.

Method

Sampling was taken by purposive sampling as many as 50 samples of farmers in West Sumbawa Regency who had at least 20 cows. The method used in this study was a survey with interview techniques at the research location to find out an overview of the location and breeders using a questionnaire followed by taking samples for the botanical composition by weighing the fresh weight of the whole cow feed. Feed was observed by separating the feed taken based on its type, such as legume, grass, agricultural waste, and weed feed. After that, each type of feed was identified which had been separated using the Plant Net application. Followed by calculating the botanical composition by looking at the percentage of the number of plants as measured by the overall comparison. The feed that has been separated is then weighed fresh and taken ± 300 grams to be used as a sample. The samples obtained were then brought to the laboratory to be tested for the quality of the forage plants by proximate analysis using the AOAC method (Horwitz et al., 2005) and followed by digestibility analysis (Tilley et al., 2006). The data obtained in the study were tabulated and the average value was analyzed using a computer with the Microsoft Excel program (Santoso et al., 2005).

Result and Discussion

Botanical Composition of Cattle Forage Plants

Based on the results of the study showed that the botanical composition of forage plants was dominated by legume feed. The botanical composition of the feed consists of 19 types of feed plants, further details can be seen in Table 1.

Table 1. Average Botanical Composition of Cattle Feed Plants on West Sumbawa Regency

Plant Type	%	Local name	Scientific name	%
Legume	52.94	Lamtoro	*Leucaena leucocephala*	46.16
		Gamal	*Gliricidia sepium*	5.05
		Kacang hijau	*Vigna radiata*	1.32
		Kelor warna	*Sesbania bispinosa*	0.18
		Kacang kuning	*Teramnus labialis*	0.12
		Brobos	*Alysicarpus vaginalis*	0.11
Grass	42.83	Rumput lapangan	*Poaceae*	33.33
		Rumput Odot	*Pennisetum purpureum cv. Mott*	4.74
		Rumput Gajah	*Pennisetum purpureum Schaum*	3.95
Waste	3.23	Tebon jagung	*Zea mays*	0.81
		Jerami padi	*Oryza sativa*	2.46
		Kulit jagung kering	-	0.76
Weed	1	Meniran	*Phyllanthus urinaria L*	.
		Jotang kuda	*Synedrella nodiflora*	.
		Kangkung liar	*Ipomoea lacunosa L.*	.
		Jute	*Corchorus aestuans*	.
		Patikan Kebo	*Euphorbia hirta*	.
		Aur-aur	*Commelina diffusa*	.
		Tempuyung	*Sonchus arvensis*	.
Total	100			100

The average botanical composition of cattle feed in Table 1 shows that the dominant percentage of botanical composition comes from legume species with 52.94%. The dominant composition of legume of lamtoro (*Leucaena leucocephala*) in breeders surveyed is due to the lamtoro plant's ability to grow quickly and can adapt to various soil and climatic conditions so it is easily found for cattle feed. The lamtoro plant is able to adapt well in the tropics. In addition, lamtoro is able to adapt to soils with moderate acidity between pH 5.5 - 6.5 and temperate climates (Manpaki et al., 2017). One of the lamtoro varieties that has developed well in Indonesia is the tarramba variety. The tarramba variety Lamtoro (*Leucaena leucocephala* cv. tarramba) has the advantage of being resistant to psyllid bug pest and resistant to dry seasons (Y. Sutaryono et al., 2023).

The lamtoro plant has upright brownish-white or reddish-brown stems, has fork-shaped stem branches, small leaf shapes with two double pinnate veins, with a total of 4-8 pairs, and each petiole fin has 11-22 leaf stalks. The flowers are white, are rounded flowers, and compound flowers resemble a cup without leaf pads, and are capable of self-pollinating. The fast growth of the lamtoro plant and its high forage production have many benefits for the environment (Lodong et al., 2022).

The lamtoro plant has several chemical compounds in lamtoro leaves, including protein, fat, calcium, vitamins (A, B1, and C), phosphorus and iron. Lamtoro gung seeds contain protein, mimosin, leukanin,

leukanol. According to Utami et al. (2020), the compounds contained in lomtoro leaves include 40% carbohydrate, 25.90% protein, 4.0% tannin, 7.17% mimosin, 2.36% calcium, 0.23% phosphorus, and nitrogen 4.20%.

Farmers on the island of Sumbawa have quite good experience in the cattle business. They know that giving lamtoro feed plants can accelerate the growth of cows compared to grass feed, so the average breeder on the island of Sumbawa uses lamtoro as a basis for cattle feed (Dilaga et al., 2021).

Sutaryono et al. (2023) states that the ideal botanical composition consists of 60% grass and 40% legumes, further Tahuk et al. (2021) explained that legumes have a very important role in the use of feed as the main source of forage for livestock, because it can increase the nutritional value of the forage given. Thus the quality of crops/feed for cattle on Sumbawa Island is high, because the type of feed that dominates the total proportion of legumes, namely lamtoro is 46.16%.

In the ARISA project on the island of Sumbawa, a population of 716 cattle breeders was recorded, where 328 breeders do not have lamtoro, 170 beef farmers use wild lamtoro, and 218 cattle breeders own and use their own lamtoro as cattle feed (Dahlanuddin, 2017).

It was further explained that the use of lamtoro leaves in feed for adult Bali cattle and calves fed basal native grass provides better growth compared to only being given native grass (Putra et al., 2019). The use of lamtoro as a feed plant for cattle has become a common feed on the island of Sumbawa.

Figure 1. Lamtoro tarramba (Leucaena leucocephala cv. tarramba)

Percentage of Feed Plants Given

The research shown that cattle breeders on the West Sumbawa Regency usually provide feed based on lamtoro plants and native grass plants. The percentage of the botanical composition of native grasses provided to the cattle can be seen in Table 2. Table 2 shows that the percentage of Bermuda grass (*Cynodon dactylon*) is quite high compared to other grasses, this is because the survival ability of this grass is quite high compared to other types of grass. Even this grass is able to survive on barren land in the dry season eventhough the growth of the leaves is minimal.

Table 2. Composition of Native Grasses for Cattle Feed

Local name	Scientific name	Average %
Rumput Bermuda	*Cynodon dactylon.*	46.50
Rumput Lampuyangan	*Panicum repens*	9.12
Rumput Jampang	*Digitaria ciliaris*	8.91
Rumput Kerbau	*Paspalum conjugatum*	6.74
Rumput Dimeria	*Dimeria Ornithopoda*	5.16
Rumput Belulang	*Eleusine indica*	5.05
Rumput Empritan	*Erarostis tanella*	5.03
Rumput Tapak jalak	*Dactiloctenium aegyptium*	4.08
Rumput Bebek	*Echinoclhoa sp.*	3.39
Rumput Teki	*Cyperus rotundus.*	3.03
Rumput Kalamenta	*Leersia hexandra*	2.17
Alang-Alang	*Imperata cylindrica*	0.82
Total		100

Cynodon dactylon, or what is often called Bermuda grass, is a type of grass that comes from tropical and subtropical regions, including Asia, Africa and South America. This grass has small and thin leaves and can grow quickly on arid and less fertile soil (Kamchoom et al., 2022). *Cynodon dactylon* is also used as a green grass in many places around the world, especially in areas that are arid and difficult to cultivate. This grass is also often used as animal feed because of its good nutritional content, in some places *Cynodon dactylon* is considered an invasive species because it can spread quickly and take over areas that should be occupied by native grass species. Therefore, the use of this grass needs to be considered properly and controlled so as not to damage the existing ecosystem.

Figure 2. *Cynodon dactylon*

The nutrient content of natural grass *Cynodon dactylon* is 9.08% crude protein, 48.17% crude fiber and 45.94% TDN. From an overview of the nutritional value of this grass, it has the potential to be utilized as a source of fodder for grazing (Lodong et al., 2022). But as a feed base for cattle it is not recommended because it has a

fairly high crude fiber content. Natural grass on the island of Sumbawa in the lowlands has a high fiber fraction (Seu et al., 2020). Other things that affect nutrient content such as the fiber fraction, especially the crude fiber, that can affect digestibility in livestock (Indriani et al., 2020).

Furthermore, *Panicum repens* has a fairly high percentage in Table 2, second rank than the other grasses. Originally from Africa and now spread throughout the world, including North America, Australia, and Southeast Asia. This grass can grow up to 2 meters tall and can be found in a variety of habitats, including grasslands, roadsides and farmland.

Figure 3. *Panicum repens*

The next grass is *Digitaria ciliaris,* has a fairly high percentage in Table 2, third rank compared to other grasses. This grass is a species of grass that is native to South America, but is now widespread worldwide as an invasive species that often grows in disturbed areas such as highways, golf courses and vacant lots. This species has the ability to grow quickly and spread easily, which can lead to competition from native grass species and reduce biodiversity (Anderson et al., 2021).

Figure 4. *Digitaria ciliaris*

Known as mist grass, this plant has narrow and long leaves, small flowers in bunches, and fibrous roots that grow shallowly. Mist grass can grow up to 120 cm tall and has a leaf shape that is very similar to other grasses. This species usually flowers in summer and rainy season.

Paspalum conjugatum or in English known as Buffalo grass which ranks fourth in Table 2, is a grass species originating from South America, but is now widely distributed throughout the world as an invasive species. This grass is usually found in tropical and subtropical areas, and can grow in a variety of soil types including sandy soils, and clay soils.

Figure 5. *Paspalum conjugatum*

Paspalum conjugatum has wide, oval-shaped leaves, stems that spread along the ground, and rhizomes or rhizomes that grow below the ground (Zhang et al., 2020). This grass can grow up to 1 meter high, and usually flowers in late summer and early fall.

Although *Paspalum conjugatum* can provide benefits as animal feed and as a raw material for food processing products such as flour, as an invasive species it can be a problem for the native ecosystems where it grows. This grass has the ability to grow quickly and spread aggressively, so it can outcompete native grass species and reduce biodiversity.

Figure 6. *Dimeria ornithopoda*

Furthermore, *Dimeria ornithopoda*, is in fifth place compared to other grasses. This grass is a grass species originating from South America, particularly from tropical regions such as Brazil, Bolivia, Paraguay, and Argentina (Naik et al., 2016). This species thrives in tropical and subtropical climates and can grow in a wide variety of soils, including clay, sand, and rocky soil. *Dimeria ornithopoda* have long, narrow leaves, slender, erect stems, and flowers consisting of long, pointed stalks. This plant can provide benefits as animal feed and as soil binding plants to reduce erosion, and species that grow quickly and spread aggressively, can become invasive species that threaten the sustainability of other grass ecosystems.

Next, *Erarostis tanella* in Table 2, is in sixth place. This plant is a species of grass that is native to Africa, but has now spread to many parts of the world including North America, Asia, Australia and New Zealand. As a species that is tolerant of various soil types and climates, *Eragrostis tenella* has spread widely to various habitats such as vacant land, roadsides, grasslands, and other disturbed areas.

Figure 7. *Eragrostis tanella*

Eragrostis tenella has the ability to grow quickly and spread aggressively, so that it can become an invasive species that threatens the sustainability of native ecosystems in the areas where it grows (Jumatang et al., 2020). This grass can be controlled in various ways, such as using herbicides, manual harvesting, and using animals to graze the grass. Although it can be an invasive species, this grass also has positive benefit, such as being a source of animal feed and a basic ingredient for bioethanol production. In addition, this species can also be used as a soil binder to reduce erosion and improve soil fertility.

Furthermore, *Dactiloctenium aegyptium* in Table 2, is in seventh place compared to other grasses.

Figure 8. *Dactiloctenium aegyptium*

Dactyloctenium aegyptium, also known as Crowsfoot grass, is a species of grass native to warm climates around the world, including Asia, Africa, America and Australia. This species usually thrives in dry, infertile soils such as clay, sand, and rocky soil. This grass is known as a grass species that is highly adaptive and tolerant of various environmental conditions, such as extreme temperatures, drought, and infertile soil conditions (Koura et al., 2022). This species grows rapidly and has the ability to spread aggressively via seeds and stolons.

Figure 9. *Echinochloa sp.*

Next grass is *Echinochloa sp*., ranked eighth in Table 2, is a type of weed plant that belongs to the family Poaceae or grasses. This plant can grow in a variety of soil types, including in moist areas such as paddy fields, rice fields, or areas that are waterlogged. Several types of *Echinochloa sp*. known as an invasive species that can cause disruption to agriculture.

Several types of *Echinocloa sp*. known among them are *Echinocloa crus-galli* or also known as chicken grass, *Echinocloa colona* or buffalo grass, and *Echinocloa pyramidalis* or puzzle grass. This plant has a leaf shape

similar to grass in general, but usually has a larger size and grows in dense clumps.

This grass grows very quickly and spreads easily through seeds or rhizomes. Because of this, this plant is often considered an invasive species that can cause problems in crops grown by farmers. However, on the other hand, several types of *Echinocloa sp*. also has benefits as animal feed or as a source of fiber.

Next is *Cyperus rotundus* which is in ninth place. This plant genus is from the Cyperaceae family. In Indonesia this plant is known as teki grass. This is actually not a true grass but a sedge. The sedges consist of more than 900 species spread throughout the world, including in tropical and subtropical regions. Some *Cyperus* species are found growing in aquatic environments, such as swamps, rice paddies, and river banks, while others grow in drier areas such as savannas and grasslands.

Figure 10. *Cyperus rotundus*

Some species of this sedge are found growing naturally in Africa, Asia and the Americas, while others are native to other areas such as Australia and the Pacific.

This sedge has various benefits that are beneficial to humans, including as a food ingredient and traditional medicine (Nurjanah et al., 2018). Some *Cyperus* species are also used as ornamental plants or room decoration plants. However, some of these grass species can also become invasive species that threaten the survival of native ecosystems.

Leersia hexandra is a type of plant that belongs to the grass family (Poaceae). In Table 2 this grass has a lower percentage compared to *Cyperus*. This plant originates from Southeast Asia and East Asia, including Indonesia, the Philippines and China.

Figure 11. *Leersia hexandra*

Leersia hexandra has also been the subject of significant scientific research, because this plant has several unique and interesting properties. For example, *Leersia hexandra* can grow and live in very different environments, including areas with very wet or dry soil conditions (Ode et al., 2020).

Imperata cylindrica (Alang-alang), has the lowest percentage of other grasses. reeds are a type of grass originating from tropical and subtropical regions in Asia, Africa and Australia. This grass can grow to a height of about 1-2 meters and has roots that can grow very deep in the ground.

Figure 12. *Imperata cylindrica*

Reed grass has a long history of use by humans. In Southeast Asia, for example, this grass has been used as a fuel, a building material, and as a basis for making paper and cloth. In some areas of Africa, this grass is used as a food ingredient.

Imperata grass is also considered a weed or invasive plant because it can take over agricultural land and inhibit the growth of other plants (Hidayat et al., 2019). This grass was introduced in the United States as an ornamental plant in the early 20th century, but then

spread to various regions and disrupted natural ecosystems.

This grass also contains chemical compounds that have the potential to be used in traditional and modern medicine. Several studies have shown that extracts from reed grass can have antioxidant, anti-inflammatory and anticancer activities. *Imperata* grass covers a long history of human use, as well as its positive and negative impacts on ecosystems and people. The plant also has potential in the development of medicines and other products that can be beneficial to human health.

Quality of Cattle Forage Plants

The nutritional content of forage plants will determine the quality of the feed. The nutritional content of the cow feed analyzed in the form of dry matter, crude protein, and dry matter digestibility can be seen in Table 3.

Table 3. The content of dry matter (DM), crude protein (CP), and dry matter digestibility (DMD) of cattle feed

Repetition	DM (%)	CP (%)	DMD (%)
1	23.10	16.59	43.06
2	23.92	15.42	43.68
3	24.00	16.16	42.23
Average	23.94	16.06	42.99

Dry Matter (DM) Content of Cattle Feed

Based on the results of this study, it is known that the average dry matter content is 23.94%. Table 3 also shows that the dry matter content of the feed ingredients that make up the feed is highest in repetition 3 and the lowest is in repetition 1.

The dry matter content of cattle feed on West Sumbawa Regency is the same as that obtained by other researchers, namely between 18-20 percent which has an effect on increasing the daily weight of Bali cattle by 0.5 kg/head/day (Achadri et al., 2021).

Dry matter feed is part of animal feed that does not contain water or the water content is very low. This dry matter is usually plant residues or seeds that have been dried or preserved for use as animal feed.

The dry matter content of forage plants can vary depending on the type of plant, the age of the plant, growing conditions, and the environment in which the plant is grown. However, in general the dry matter content in forage plants ranges from 15-95%, with an average of around 20-50% and the high and low dry matter content is due to differences in forage ages when cutting (Sudirman et al., 2020).

Crude Protein (CP) Content of Cattle Feed

Based on the crude protein content of fattening cattle feed in Table 3 with an average of 16.06%, it indicates that the quality of the feed for cattle is of high quality. This was due to the high percentage of legumes in the proportion of feed ingredients that make up the feed given, which reached 52.84%.

Low-quality forage crops have a crude protein content of below 10% and medium-quality forages have a crude protein content of 10-15%, while high-quality forages have a crude protein content of above 15% (Dahlanuddin, 2017).

The standard protein requirement for an adult cow is generally around 8-10% of the total dry matter consumed, but can vary depending on age, body weight, sex, and level of production of the cow (Dassa et al., 2019).

Cows that are growing need higher protein intake to meet the needs for growth and the formation of new body tissues. Veal protein requirements can reach 16-20% of the total dry matter consumed (Awang et al., 2022).

The availability of protein in feed crops on the island of Sumbawa can be influenced by various factors such as the type of feed, processing methods, breeder knowledge and availability of nutrients (Mastur et al., 2022). Therefore, breeders on the island of Sumbawa pay attention to the quality and nutritional content of the feed given so that it can indirectly meet the nutritional needs of livestock so as to increase livestock production and optimal health.

Dry Matter Digestibility (DMD) of Feed Plants

Digestibility of dry matter is one indicator that determines the quality of forage crops. High dry matter digestibility indicates high nutrient content that can be utilized by rumen microbes. The higher the digestibility percentage of feed ingredients, the better the quality (Tahuk et al., 2021).

The standard amount of dry matter digestibility of cattle feed can vary depending on the type of feed and the level of production of the cow. However, in general, feed that is efficiently digested by cattle has a dry matter digestibility of at least 45-50% (Seymour et al., 2019). Feed with high dry matter digestibility can increase the nutritional intake of cows and maximize growth and production of cows.

The composition of cattle feed plants on the island of Sumbawa can be a reference for maintenance in other areas because the provision of feed crops which are dominated by legumes provides many benefits to the community besides being a source of feed protein, it also functions as a conservation of barren land to become fertile because it has the ability to extract nitrogen from the air and bind it to in the soil through the roots and help other plants to grow well.

Conclusion

The botanical composition of forage for cattle in West Sumbawa Regency consists of 19 types of forages,

namely 6 types of legumes, 4 types of grass, 2 types of agricultural waste, and 7 types of weeds. The percentage of the botanical composition of the feed given was dominated by legumes (53%), grass (43%), agricultural waste (3%) and weeds (1%). The feed given to cows in West Sumbawa Regency is of good quality due to the dominance of legume plants with a crude protein content of 16.06%.

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