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Article

Botanical Composition and Forage Identification in Buffalo Grazing Lands of Salo Sub-district, Kampar Regency

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A B S T R A C T

Water buffaloes (*Bubalus bubalis*) hold a strategic role in smallholder farming systems and rural food security. Natural pastures in Salo Sub-district, Kampar Regency, serve as the primary extensive feed source. However, native forage productivity frequently faces constraints due to low soil fertility and high grazing pressure. This study aims to identify the botanical species and analyze the composition of forage vegetation in buffalo grazing lands within Salo Sub-district using an exploratory descriptive survey method combined with a vegetation analysis approach. Based on field observations, the botanical composition of the forages is categorized into three main groups. The identified grass species include *Axonopus compressus* (tropical carpet grass), *Paspalum conjugatum* (carabao grass), and *Cynodon dactylon* (Bermuda grass). The identified weed species include *Spermacoce latifolia*, *Melastoma malabathricum* L., *Ammannia baccifera* L., and *Asystasia gangetica*, some of which are utilized flexibly by livestock as part of mixed forage diets.

1. Introduction

The ruminant livestock subsector plays a highly strategic role in meeting public animal protein requirements and driving the rural economy (Novita et al., 2019). In Kampar Regency, Riau Province, the development of ruminant livestock is supported by the abundant availability of feed resources from both natural forage and agricultural wastes. Kampar Regency possesses significant feed potential with a regional carrying capacity that remains highly adequate to support the ruminant livestock population (Novita et al., 2019). On the other hand, enhancing livestock productivity at the local level also requires the implementation of applicable feed technologies based on local regional resource potentials (Novita et al., 2022).

One of the ruminant livestock commodities widely raised by the community in Kampar Regency is the swamp buffalo. The buffalo-rearing system in this region generally relies on natural pastures, swamp lands, and areas around inland waters overgrown with forage vegetation types. The physical characteristics and quantitative performance of local buffaloes in this area strongly influenced by the environmental quality of their foraging habitats. Understanding the genetic and morphological profiles of these local livestock needs to be aligned with the availability of their natural feed (Rahmad et al., 2025).

The pastures in Salo Subdistrict, Kampar Regency, serve as the primary feed source for free-grazing buffaloes. The dynamics of this pasture ecosystem determine the availability and diversity of forage species consumed by the livestock daily. The botanical composition of the vegetation in the pasture encompasses various species of grasses (Graminae), legumes (Leguminosae), and broadleaved weeds (broadleaves). Seasonal changes, grazing pressure, and soil characteristics in the region directly impact the shifts in botanical composition and the nutritional value of the forage (Pamungkas et al.m 2023). Identifying forage species and analyzing botanical composition are crucial steps in determinin pasture carrying and nutritional adequacy for grazed buffaloes.

Despite the vital role of the pastures in Salo Subdistrict, fundamental information regarding the inventory of forage species and their botanical composition remains extremely limited. Accurate knowledge regarding the plant species constituting the forage vegetation in the grazing area is essential to formulate sustainable pasture management strategies.

This study aims to identify the species and analyze the botanical composition of forage vegetation utilized in buffalo grazing lands in Salo Subdistrict, Kampar Regency.

2. Literature Review

2.1 Buffaloes and Their Role in Ruminant Livestock Farming in Indonesia

Buffaloes (*Bubalus bubalis*) are one of the major ruminant livestock species holding strategic and historical significance for agricultural systems and the rural economy in Indonesia. Unlike cattle, which are generally raised intensively for purely commercial purposes, buffaloes in various regions across the archipelago are frequently integrated into traditional agricultural systems, such as paddy field cultivation, meat production, and organic fertilizer supply. This ecological and economic role makes buffaloes an essential pillar of local food security, particularly in regions with wet or swampy topographies (Putra et al., 2022).

As part of the national ruminant livestock subsector, the buffalo population faces complex dynamic challenges, ranging from the conversion of traditional grazing lands into monoculture plantations to the declining quality of natural forage (Khasanah et al., 2021). Nevertheless, buffaloes possess exceptional physiological adaptation capabilities to hot tropical environments and higher crude fiber digestion efficiency compared to cattle when consuming low-quality, fibrous forages (Pamungkas et al., 2023). This enables buffaloes to utilize local vegetation growing wild in marginal grazing lands.

The availability of quality forage is a primary determinant of success in buffalo rearing and reproduction enterprises. In Kampar Regency, Riau Province, specifically in Salo Subdistrict, the existence of natural pastures still plays a crucial role for smallholder farmers in reducing the production costs of relatively expensive concentrate feed (Hidayat et al., 2020). Grazing lands in this region are generally populated by a variety of site-specific forage species, including grasses (*Graminae*), wild legumes, and broadleaves, which form a specialized forage ecosystem typical of river basins or low-lying wetlands (Zulfan et al., 2021).

The identification of forage species in buffalo grazing lands within Salo Subdistrict serves as a fundamental scientific step to evaluate the carrying capacity and nutritional quality of naturally available feed. This botanical mapping of forages not only provides information on the floristic composition of the feed vegetation but also helps identify the ratio between high-quality forages and lignified forages that are less favored by livestock (Wardi et al., 2024). In-depth knowledge of local forage availability is essential for formulating sustainable grazing management strategies.

More broadly, the integration of an understanding of buffalo biological characteristics and local feed resource availability in Salo Subdistrict will support overall improvements in ruminant livestock productivity. Enhancing the efficiency of natural pasture utilization through the introduction of forage botanical data can mitigate the risk of feed shortages during certain seasonal changes while preserving the environmental sustainability of grazing lands (Santoso et al., 2022). Consequently, local forage-based buffalo management in Kampar can serve as a pilot model for adaptive, resilient, and environmentally conscious ruminant livestock development in Indonesia.

2.2 Buffalo Population in Kampar Regency and Salo Sub-district

Livestock statistical data indicates that Kampar Regency is one of the regencies with a relatively large buffalo population in Riau Province. According to data from the Riau Provincial Livestock and Animal Health Service, the buffalo population in Kampar Regency in 2025 was recorded at approximately 9,983 head, an increase from 9,835 head in the previous year (Dinas Peternakan dan Kesehatan Hewan, 2025). This data illustrates a conservative trend in traditional grazing buffalo production systems across parts of the region, including Salo Sub-district. This buffalo population reflects the importance of adequate forage availability to support the productivity and sustainability of the population.

2.3 Forage Potential in Kampar Regency

Kampar Regency is one of the regions in Riau Province with great potential for the development of the ruminant livestock sector, particularly beef cattle and buffalo. The success of a ruminant livestock enterprise is largely determined by the availability of quality forage, encompassing quantity, quality, and continuity. In Salo Subdistrict, Kampar Regency, the management system for ruminants such as buffalo still predominantly relies on public grazing lands and open areas as the primary feed source. Therefore, identifying the types and potential of forage in the grazing lands of this region is a crucial step to determine the environmental carrying capacity for the livestock population.

In general, forage vegetation in the grazing lands of Kampar Regency is dominated by grasses (Gramineae), legumes (leguminosae), and woody weeds that grow naturally. Native grasses growing in the grazing lands of Salo Subdistrict generally possess high adaptability to local agro-ecosystem conditions, although their productivity is heavily influenced by seasonal factors and soil fertility. The availability dynamics of this natural forage frequently experience fluctuations, where forage production is abundant during the rainy season, yet tends to decline drastically entering the dry season.

To overcome the limited availability of forage in grazing lands, optimizing the utilization of non-conventional local resources is an absolute necessary strategy. Kampar Regency, which is dominated by the plantation and agricultural sectors, holds an abundant potential for alternative feedstuffs. Based on a study conducted by Novita et al. (2022), it was revealed that oil palm plantation waste in Kampar Regency, such as oil palm fronds and leaves, can generate a biomass potential reaching 51,488 kg/year, which is highly potential to support ruminant feed requirements. The utilization of this agro-industrial and plantation waste not only functions as a buffer feed when grazing land productivity decreases, but is also capable of improving maintenance cost efficiency for local farmers.

3. Research Methodology

This study employed a descriptive-exploratory approach. The objective of this method was to collect detailed data on the types of forage vegetation growing in and utilized by swamp buffalo in the grazing areas of Salo District, Kampar Regency, Riau Province, without applying any treatments or manipulating existing variables. The research was conducted

from October to December 2025, during the rainy season.

3.1 Instruments and Materials

The equipment used in this study included a 1 x 1 meter quadrant frame for vegetation analysis, raffia ropes, wooden pegs, plant shears/cutters for forage sampling, plastic bags, identification labels, a digital camera or smartphone for visual documentation, stationery, observation sheets, and a plant identification application (PlantNet).

The materials used in this study consisted of the forage vegetation found at the research site.

3.2 Sampling Technique

The observation points were determined using a purposive sampling method, which is a deliberate sampling technique representing the buffalo grazing area. Quadrrat plots measuring 1 x 1 meters were placed systematically at 50 meter intervals across the grazing area, extending from the edge toward the inner part.

3.3 Data Collection and Analysis

Data were obtained through direct field observations by identifying all vegetation types (including grasses, legumes, weeds, and other herbaceous species) present within the quadrat plots or those observation transects. Every forage species found within the plots was photographed and sampled for subsequent identification using the PlantNet application, supplemented by herbarium analysis where necessary.

The collected data were analyzed using a descriptive qualitative approach, presenting the findings in descriptive accounts and an inventory table of forage species, complete with their scientific names, families, and utilization status by the buffalo.

4. Results and Discussion

Based on field observation results, several types of forage were identified, as presented in Table 1.

Table 1. Results of forage identification in the swamp buffalo grazing land of Salo Subdistrict

Forage grasses	Legumes	Weeds
***Axonopus compressus* (Sw.) P. Beauv.**	*Calopogonium mucunoides*	*Spermacoce latifolia*
***Paspalum conjugatum* P. J. Bergius.**	*Gliricidia sepium*	*Melastoma malabathricum* L.
***Cynodon dactylon* (L.) Pers.**		*Ammannia baccifera* L.
		Asystasia gangetica

4.1 Forages Found at the Research Site

The types of grasses identified in the grazing areas include *Axonopus compressus* (Sw.) P. Beauv., *Paspalum conjugatum* P. J. Bergius., dan *Cynodon dactylon* (L.) Pers.

Axonopus compressus (Sw.) P. Beauv. commonly referred to as broadleaf carpet grass, is a widespread forage species. Its classification is as follows:

Scientific Name : *Axonopus compressus* (Sw.) P. Beauv.
Common Names : Broadleaf carpet grass, tropical carpet grass, rumput pahit (local name)
Family : Poaceae
Taxonomy :
Kingdom : Plantae
Division : Tracheophytes
Subdivision : Angiospermae
Class : Monocotyledonae
Order : Poales
Family : Poaceae
Subfamily : Panicoideae
Genus : *Axonopus*
Spesies : *Axonopus compressus*
USDA (2016).

This species exhibits a creeping growth habit, forming dense carpet-like mats through stolons and short rhizomes (stoloniferous). It is commonly utilized as a permanent pasture forage component, consumed directly via grazing by various ruminants, including buffalo and cattle. However, due to its moderate-to-low nutritional value and low biomass production, it is generally considered less suitable for cut-and-carry systems (Fern et al., 2023).

Figure 1. *Axonopus compressus* (Sw.) P. Beauv.

The second species identified is *Paspalum conjugatum*, commonly known as carabao grass. This grass is prevalent in tropical regions and is frequently associated with buffalo grazing. Its classification is detailed below:

Common Names : Rumput kerbau *carabao grass*, *hilo grass*, *sour paspalum*.
Scientific Name : *Paspalum conjugatum* P. J. Bergius.
Family : Poaceae
Taxonomy :
Kingdom : Plantae
Division : Tracheophytes
Subdivision : Angiospermae
Class : Monocotyledonae
Order : Poales
Family : Poaceae
Genus : *Paspalum*
Species : *Paspalum conjugatum*

Paspalum conjugatum grows via stolons (stoloniferous habit), forming dense vegetative mats across the soil surface. This plants is well-suited and commonly used as forage for water buffaloes, which is the origin of its common name, "carabao grass". Although cattle sometimes show lower preference for this grass during its flowering stage, it remains a suitable forage source for buffaloes (Bergius, 1772).

Figure 2. *Paspalum conjugatum*

The final species identified is *Cynodon dactylon* (L.) Pers., commonly known as Bermuda grass, Bahama grass, or *dhoob*. Its taxonomic details are as follows:
Kingdom : Plantae
Order : Poales
Family : Poaceae
Genus : *Cynodon*
Spesies : *Cynodon dactylon*

Cynodon dactylon is a perennial grass that spreads via stolons and rhizomes, creating dense stands. It is highly valued for grazing purposes. Despite having moderate nutritional value, it is widely consumed by ruminants, including buffaloes, and can be utilized both as fresh forage and in the form of hay.

Figure 3. *Cynodon dactylon*

4.2 Legumes Found in the Research Location

The legume species found in the pastureland include *Calopogonium mucunoides* and *Gliricidia sepium*.

Calopogonium mucunoides belongs to the legume family, commonly known as calopo. This plant is utilized as a forage component for ruminant livestock (including cattle and buffalo) due to its high crude protein content as a plant-based protein source. The utilization of *Calopogonium mucunoides* as feed material or silage processing can support the fulfillment of livestock nutrient requirements (Fitri et al., 2021). Nevertheless, the livestock palatability level for this forage is classified as moderate to low during early growth because its surface is covered with fine hairs, yet it is still voluntarily consumed by ruminants as part of mixed pasture grazing.

Figure 4. *Calopogonium mucunoides*

Gliricidia sepium, commonly known as gamal (mother of cocoa), is a plant species that plays a crucial role in animal husbandry, specifically as a protein-enriching forage source for ruminants (Amalyadi, 2025). Ecologically, this plant is frequently utilized to help control weed growth, such as cogon grass (*Imperata cylindrica*). It grows as a tree reaching heights of 2 to 15 meters, features an upright stem, and possesses a propagation system that is easily achieved through stem cuttings.

Based on the botanical classification system, the taxonomy of the gamal plant is as follows:

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Fabales
Family : Fabaceae (Leguminosae)
Subfamily : Faboideae (Papilionoideae)
Genus : *Gliricidia*
Species : *Gliricidia sepium* (Jacq.) Steud.

Gamal is a highly nutritious forage with a crude protein content reaching 20% to 25%, making it highly potential as a protein-rich supplementary feed for large ruminant livestock such as cattle and buffalo, particularly to overcome forage quality deficiencies during the dry season (Amalyadi, 2025). Nonetheless, feeding it to ruminants is recommended in a slightly wilted condition first to reduce the levels of anti-nutritional compounds contained within it, thereby optimizing its digestibility and palatability.

Figure 5. Gamal (*Gliricidia sepium*)

4.3 Weeds Found in the Research Location

Other than grasses and legumes, several other forage species were identified and classified as weeds, namely *Spermacoce latifolia*, *Melastoma malabathricum* L.

Spermacoce latifolia Aubl. (atau *Borreria alata* (Aubl.) DC.) is classified as a broadleaf weed rather than a true grass (Poaceae) or a legume (Fabaceae). It is commonly referred to as "buttoweed" or "broadleaf buttonweed". The taxonomic classification of this plant is as follows:

Kingdom : Plantae
Division : Tracheophyta
Class : Magnoliopsida
Order : Gentianales
Family : Rubiaceae
Genus : *Spermacoce* (or *Borreria*)
Spesies : *Spermacoce latifolia* Aubl.

While generally categorized as a weed in plantation areas, certain species within the Rubiaceae family can be utilized as a flexible component of mixed forage for ruminants, such as cattle, goats, and buffaloes, although they do not serve as a primary feed source (Solfiyeni et al., 2025).

Figure 6. *Spermacoce latifolia*

Melastoma malabathricum L. commonly known as the "senduduk" or "Straits rhododendron", is a wild plant frequently found in open areas, grasslands, and plantations (Hikam et al., 2024). In Indonesia, it is known by various local names such as *harendong*, *senggani*, *kamanden*, and *karamunting* (Rahayu et al., 2021). The taxonomic classification of this plant is:

Kingdom : Plantae
Division : Tracheophyta
Class : Magnoliopsida
Order : Myrtales
Family : Melastomataceae

Genus : *Melastoma* L.
Spesies : *Melastoma malabathricum* L.

Melastoma malabathricum is a perennial shrub or woody herb that can reach a height of 0.5 to 3 meters with extensive branching (Wibowo et al., 2023). In smallholder livestock systems or grazing systems, this plant is often found in the habitats of swamo buffalo and cattle. Field observations on forage in grazing areas indicate that this plant is generally found in limited quantities or is non-dominant due to its low palatability for large ruminants (Hikam et al., 2024).

Figure 7. *Melastoma malabathricum* L.

Ammannia baccifera L. is generally categorized as a wetland or aquatic weed, distinct from grasses and legumes. This plant is frequently found in paddy fields and near water bodies. Its taxonomic classification is:

Kingdom : Plantae
Phylum : Tracheophyta
Class : Magnoliopsida
Order : Myrtales
Family : Lythraceae
Genus : *Ammannia*
Spesies : *Ammannia baccifera* L.

This plant is uncommon or intentionally avoided as a primary feed source for livestock (including buffaloes and cattle) because its leaves contain acrid compounds that may cause irritation, skin blistering, and digestive disturbances if consumed in large quantities.

Figure 8. *Ammannia baccifera* L.

Asystasia gangetica is categorized as a broadleaf weed in plantations and agricultural lands, also known as "Chinese violet" or "creeping foxglove." It exhibits a creeping, semi-erect growth habit and can spread rapidly to form ground cover.

Asystasia gangetica is considered a highly potential forage source for ruminants, such as cattle, goats, sheep, and buffaloes, particularly in integrated plantation systems (e.g., under oil palm or rubber canopies) (Infitria & Jiyanto, 2025). The taxonomic classification of this plant is:

Kingdom : Plantae
Division : Tracheophyta
Subdivision : Angiospermae
Class : Eudicots
Subclass : Asteridae
Order : Lamiales
Family : Acanthaceae
Genus : *Asystasia*
Spesies : *Asystasia gangetica* (L.) T. Anderson

Figure 9. *Asystasia gangetica*

5. Conclusion

The botanical composition of forage in buffalo pastures located in Salo Subdistrict, Kampar Regency, is classified into three main groups, namely grasses, legumes, and weeds/forbs. The grass group is dominated by *Axonopus compressus*, *Paspalum conjugatum*, and *Cynodon dactylon*, which serve as the primary feed source. The legume group, represented by *Calopogonium mucunoides* and *Gliricidia sepium*, functions as a high-protein supplier to complement the livestock's nutritional requirements. The weed/forb group identified includes *Spermacoce latifolia*, *Melastoma malabathricum* L., *Ammannia baccifera* L., and *Asystasia gangetica*, some of which are flexibly utilized by the livestock as part of a mixed diet.

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