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Assessment of Pastoral Potential of Earial Pastures at the Centre for the Conservation, Multiplication and Dissemination of Endemic Ruminant Livestock in Madina Diassa, Rural Commune of Gouanan, District of Yanfolila, Mali

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Authors' contributions

This work was carried out in collaboration among all authors. Author BK conceptualized the study, conducted data collection and treatment, performed data analysis and investigation, developed the methodology, carried out validation and data visualization, and wrote and prepared the original draft of the manuscript, as well as reviewed and edited it. Author MK supervised the work, conducted the investigation, developed the methodology, carried out validation and data visualization, and contributed to writing, reviewing, and editing the manuscript. Author TS reviewed and edited the manuscript, translated it into English, and performed validation. Authors DG and DT wrote, reviewed and edited the manuscript. All authors read and approved the final manuscript.

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Original Research Article

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Abstract

Mali, a vast West African country characterized by predominantly arid and semi-arid conditions, relies heavily on agropastoral systems where livestock plays a crucial role in national livelihoods and the economy. However, increasing pressures from climate change, bushfires, and land-use conflicts are progressively reducing pasture productivity and threatening sustainable livestock management. This study was conducted at the Centre for the Conservation, Multiplication and Dissemination of Endemic Ruminant Livestock in Madina Diassa (Mali). Its objective was to characterize aerial pastures. The transect method was used to inventory woody flora and assess floristic composition, cover and pastoral value according to soil type. A total of 78 woody species belonging to 27 families were identified, 92.3% of which were forage species. Fabaceae and Combretaceae were the most represented families. Forage species were most abundant on ferruginous soils (56 species), followed by sandy loam soils (49) and gravelly soils (48). The flora is dominated by moderately palatable species (47%). Pastoral value remains low, with averages of 30.56% (clay-sandy soils), 26.60% (gravelly soils) and 26.39% (ferruginous soils). These results highlight the need to extend the study to the entire ranch for better management of plant resources.

Keywords: Aerial pastures; floristic composition; ranch; pastoral value; Madina Diassa; Yanfolila; Mali.

1. Introduction

Mali, a vast continental country in West Africa, stretches between 10° and 25° north latitude and 4° east longitude and 12° west longitude, covering an area of 1,241,238 km²). It is situated between the 10th and 25th parallels of north latitude and between 4° east longitude and 12° west longitude. It is a landlocked country in the heart of West Africa, surrounded by over 7,000 km of border with seven (7) neighboring countries (Diarra, 2020).

As a country with an agropastoral vocation, agriculture and livestock farming constitute the main economic activities. The national livestock population is estimated at nearly 12 111 128 cattle, 19 183 500 sheep, and 26 486 240 goats, 584 184 horses, 1 144 336 donkeys, 1 241 093 camels, 86 182 pics et 49 617 572 subjects of poultry (Coulibaly, 2022).

Livestock farming contributes 15.2% to GDP, after agriculture (16.2%) and before gold mining (7.2%) (INSTAT 2015). Animal feed relies primarily on the exploitation of natural pastures, supplemented during the dry season by fodder trees, producing on average more than 1,000 kg/ha/year (Diarra, 2010; Gounot, 1969).

Pasture productivity varies from 0.5 to 2 t/ha in the Sahel (Boudet, 1979), compared to 3 to 10,6t/ha in the sudanian zone (Sanon et al., 2014). However, human pressures (land clearing, bushfires, deforestation) and climate change are reducing productivity (Cissé, 1986).

The grass production in these Sahelian pastures, worth billions of francs, is destroyed by bushfires every year (Kanambaye et al., 2022).

The herds are herded by a shepherd during the rainy season in the district Yanfolila, while in the dry season they graze freely (Camara et al., 2020). However, the lack of clear boundaries between agricultural and pastoral areas limits access to grazing lands. In contrast, the Center for the Conservation, Multiplication, and Dissemination of Endemic Ruminant Livestock (CCMD-BRE) operates as a ranch, dedicated to the preservation and promotion of the N'Dama cattle breed, known for its hardiness and resistance to trypanosomiasis (Camara et al., 2020). Originally from Fouta Djallon (Guinea), this breed is present in Mali in the regions of Kita, Bougouni and Yanfolila.

Madina Diassa covers an area of over 321,600 hectares (PROGEBE, 2015), and Between 1975 and 1981, a 10,000-hectare ranch and a breeding herd of 1,800 N'Dama cattle were established (Camara et al., 2020).

Despite its potential and efforts to integrate agriculture and livestock farming, the center suffers from chronic forage deficits due to climate shocks and the lack of pastoral infrastructure. Few recent studies have focused on the management of the N'Dama breed's ancestral homeland. However, a better understanding of the forage potential and its suitability to nutritional needs is essential for the sustainable management and preservation of this threatened breed in Mali.

It is in this context that the present study, entitled Characterization of aerial pastures at the Madina Diassa Centre for the Conservation, Multiplication and Dissemination of Endemic Ruminant Livestock in the rural commune of Gouanan, circle of Yanfolila in Mali.

2. Materials and Methods

2.1 Presentation of the Study Area

This study was conducted in the rural commune of Gouanan, specifically in the village of Madina Diassa, CCMD-BRE site. Located in the agro-ecological zone of the upper Bani region of western Niger, the commune features a landscape of lateritic plateaus alternating with valleys and plains. The average altitude is 325 m; the valley bottoms, rich in silty-clay soils, are the main cultivated areas (Fig. 1).

The climate is of the Sudanese-Guinean type, with annual rainfall between 1,200 and 1,300 mm and an average temperature of 28 °C. The dry season extends from November to March, and the rainy season from April to October.

The vegetation is dominated by shrub formations (*Detarium) microcarpum, Combretum glutinosum, Lannea microcarpa, Parinari curentellifolia, Isoberlinia doka, Vitellaria paradoxa)* and a grassy cover marked by *Andropogon gayanus*.

2.2 Equipment

2.2.1 Technical Equipment

The technical equipment used for data collection consists of:

- A GPS device for taking coordinates;
- Phytoecological survey sheets and a pen for taking notes;
- A 50 m measuring tape to delimit the plots;
- Stakes with blue bags at the end to delimit the plots;
- A key for identifying woody plants: "Trees, Shrubs and Vines of West Africa" (Arbonnier, 2000)
- A techno mobile phone for taking photos.

2.2.2 Plant Material

The plant material consisted of the woody species (trees and shrubs) found in the different study plots of the pastures (Fig. 2).

2.3 Methods

To select the soil types, we made a tour in the ranch with the relevant people. Among the soil types encountered, the sampling involved ferruginous soil (Sonson dugukolo), the gravel soil (Bèlè dugukolo) and clay-sandy soil (Bira dugukolo).

System Adopted for the Readings: The design used is a 350 m long transect, consisting of three rectangular unit plots (P1, P2, P3) measuring 20 m wide and 50 m long (Fig. 3). Each plot has an area of 1000 m² (Fig. 3) (Traoré et al., 2022).

2.3.1 Vegetation Structure of the Pastures of the CCMD-BRE of Madina Diassa

The vegetation characterization consisted of estimating, by visual assessment, the cover of the different strata in each individual plot according to the Gounot scale (1969). The parameters evaluated are: Overall Vegetation Cover (OVC), that of the Herbaceous Stratum (HS), Woody Stratum (WS), Tree Stratum (TS), Shrub Stratum (SS) and Low Woody Stratum (LWS).

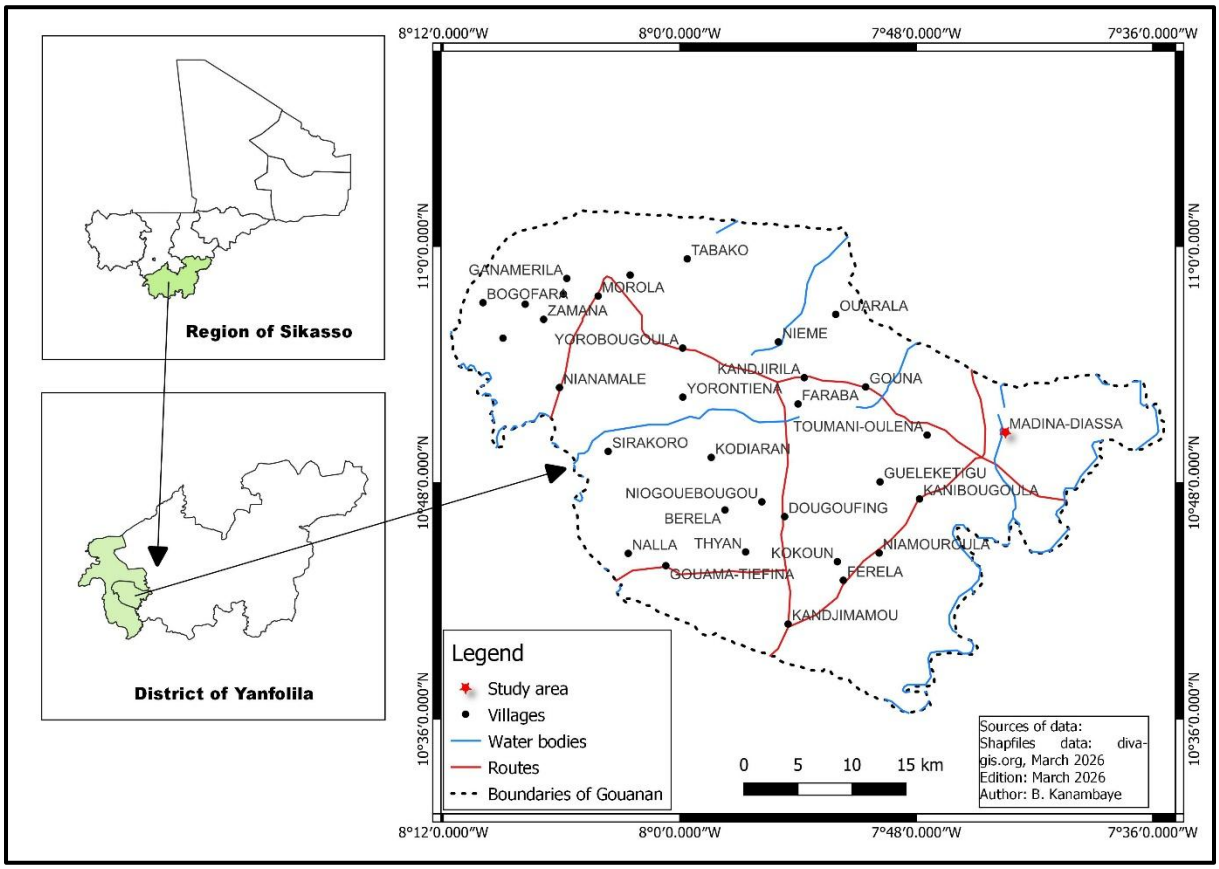

Fig. 1. Location of the study area

Fig. 2. Vegetation status of the CCMD-BRE Madina Diassa ranch

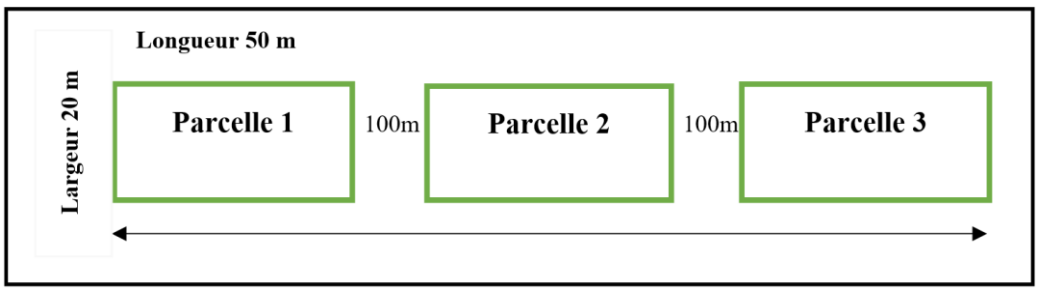

Fig. 3. Transect setup for phytoecological surveys

2.3.2 Woody Floristic Composition of the CCMD-BRE Pastures of Madina Diassa

For this step, the phytoecological inventory method was used to identify all woody species (palatable or not) in the plots (P1, P2, P3), according to soil type. Each species was assigned an Abundance-Dominance (A/D) coefficient based on the Gounot scale (1969).

Based on the floristic composition, a palatability index was assigned to each species according to the scale of Akpo et al. (2000). This classification made it possible to distinguish forage species from non-forage species. Species with a palatability index of zero were eliminated from the list (see Table 1).

2.3.3 Pastoral Value of Woody Species Found in the Study Site

Pastoral value reflects the zootechnical interest of a species or group of species for a given pasture. It varies over time and space and is determined based on species cover and a quality index linked to the palatability of the species (Daget & Poissonet, 1971; Boudet, 1979). Each species receives an index between 0 (unpalatable, poor quality) and 5 (highly palatable, excellent quality) (Saidou et al., 2010).

The formula used is as follows:

$$VP = 1/5\sum (CSi * IS)* RGV$$

VP: Pastoral value as a percentage (%);
CSI: Specific contribution of each species;
IS: Specific or quality Index of the species;
RGV: Overall vegetation cover.

To overcome the problem of overestimation, the pastoral value is weighted by the overall vegetation cover (RGV) (Akpo and Grouzis, 2000; Ngom et al., 2012; Alhassane et al., 2018).

2.3.4 Data Analysis

The collected data was entered into Excel Office 2016 software; for data processing, we used Word Office 2016 software and XLSTAT Pro software for statistical analysis.

3. Results and Discussion

3.1 Results

The various results obtained during this study relate to the structure of the plant formations, the woody floristic composition of the pastures and the woody pastoral value of the pastures of the CCMD-BRE of Madina Diassa.

3.1.1 Structure of Woody Formations

This refers to the cover of the woody layer (RSL), the cover of the tree layer (RSA), the cover of the shrub layer (Rsa) and the cover of the low woody layer (RSBL) of woody formations without distinction of treatments.

Analysis of Fig. 4 shows that, regardless of soil type, the tree and shrub layers dominate over the lower woody layer. However, this predominance appears slightly more pronounced on clay-sand soils.

3.1.2 Floristic Composition of Woody Species

The woody flora of the CCMD-BRE pastures of Madina Diassa boasts a rich biodiversity, with 72 species distributed across 56 genera and 26 families (Table 1). Among these species, 92.3% are identified as forage crops for livestock feeding.

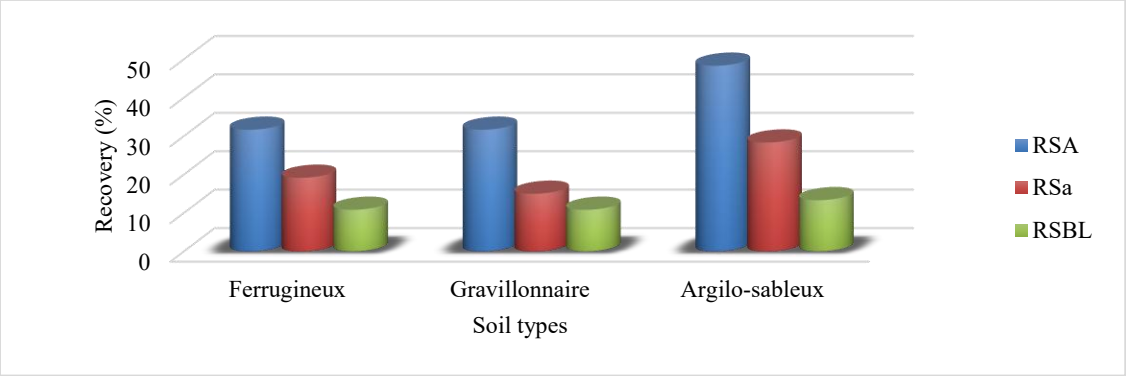

Fig. 4. Variation in the cover of woody strata in the study site

Table 1. Distribution of woody forage species according to soil type

Family	Species	IS	F	G	AS
Anacardiaceae	*Lannea acida (A. Rich)*	*3*	+	+	+
	Lannea microcarpa (Engl. and K. Krause, 1911)	*2*	-	+	+
	Lannea velutina (A. Rich)	*1*	+	+	-
Annonaceae	*Annona senegalensis (Pers.)*	*2*	+	+	+
Apocynaceae	*Baissea multiflora (A. DC)*	*2*	+	+	+
	Carissa spinarum (L)	*1*	-	-	+
	Landolphia senegalensis (A.DC.) Pichon	*2*	+	+	+
	Leptadenia hastata (Per)	*4*	+	-	-
Bignoniaceae	*Stereospermum Kunthianum (Cham)*	*4*	+	-	-
Capparaceae	*Boscia salicifolia (Oliv)*	*3*	+	-	-
Celastraceae	*Maytenus senegalensis (Lam .)*	*2*	+	-	+
Chrysobalanaceae	*Parinari curatellifolia (Planch)*	*1*	-	+	+
	Anogeissus leiocarpus (DG.) Guill . And Perr	*2*	+	+	+
Combretaceae	*Combretum ghasalens (Engl. Et Diels)*	*1*	+	+	-
	Combretum glutinosum (Perr)	*2*	+	+	+
	Combretum micranthum (G. Don)	*1*	+	-	-
	Combretum molle (R. Br.)	*1*	+	-	+
	Combretum nigricans (Lepr). Ex Guill. And Perr.	*3*	+	+	+
	Combretum velutinum	*1*	-	+	-
	Pteleopsis suberosa (Engl and Diels)	*1*	+	+	+
	Terminalia laxiflora (Engl)	*3*	+	+	+
	Terminalia macroptera (G.et Perr)	*2*	+	+	-
	Terminalia mollis (MALawson)	*2*	+	+	+
Dipterocarpaceae	*Monotes kerstingii (Gilg)*	*1*	+	+	+
Ebenaceae	*Diospyros mespiliformis (Hochst)*	*2*	+	+	+
Fabaceae	*Acacia dudgeoni (Craib)*	*2*	+	-	-
	Afrormosia laxiflora (Benth)	*2*	+	+	+

Family	Species	IS	F	G	AS
	Afzelia africana (Sm)	*2*	+	+	+
	Burkea africana (Hook)	*2*	-	+	+
	Cassia sieberiana (DC)	*2*	+	+	-
	Daniellia oliveri (Rolfe) Hutch and Dalziel	*2*	+	+	+
	Detarium microcarpum (G and Perr)	*2*	+	+	+
	Dichrostachys glomerata (Forsk)	*3*	+	+	+
	Entada africana (G and Perr)	*4*	+	+	+
	Erythrina senegalensis (DC)	*2*	+	-	+
	Isoberlinia doka (Craib) Stapf)	*2*	+	+	+
	Isoberlinia tomentosa (Harms) Craib and Stapf	*2*	+	-	-
	Ostryoderris chevalieri (Dunn)	*2*	-	+	-
	Parkia biglobosa (Jacq) Benth	*4*	+	+	-
	Piliostigma reticulatum (DC) Hochst	*2*	+	+	-
	Piliostigma thonningii (Sch.) Min- Redh	*1*	+	-	+
	Prosopis africana (G. et Perr .)	*3*	+	+	+
	Pterocapus erinaceus (Pear)	*5*	+	+	+
	Swartzia madagascariensis (Desv)	*2*	+	-	+
Hypericaceae	*Psorospermum febrifugum (Spach)*	*1*	-	-	+
Lamiaceae	*Vitex doniana / cuneata (Sw)*	*2*	+	-	-
Loganiaceae	*Strychnos innocua*	*1*	+	-	-
	Strychnos spinosa (Lam)	*2*	+	+	-
Malvaceae	*Cola cordifolia (Cav.) R. Br*	*1*	+	-	-
Moraceae	*Ficus capensis (Thunb)*	*2*	-	-	+
	Ficus ingens (Miq)	*2*	-	+	+
	Ficus iteophylla (Miq)	*2*	+	-	-
	Ficus ovata (Vahl .)	*2*	-	-	+
Myrtaceae	*Syzygium sp*	*1*	-	+	-
Ochnaceae	*Lophira lanceolata (Van Tiegh)*	*1*	+	+	+
Olacaceae	*Ximenia americana (Lim)*	*1*	+	-	-
Opiliaceae	*Opilia celtidifolia (G and Perr)*	*1*	+	+	+
Phyllanthaceae	*Bridelia ferruginea (Benth)*	*1*	+	+	-
	Hymenocardia acida (Tul)	*1*	+	+	+
	Securinega virosa (Roxb Baill)	*2*	+	+	+
	Uapaca togoensis (Pax)	*2*	-	+	+
Polygalaceae	*Securidaca longipedunculata (Fres)*	*1*	-	-	+
Rubiaceae	*Crossopteryx febrifuga (Afzel benth)*	*2*	+	+	+
	Fagara zanthoxyloids (Lam)	*1*	+	+	+
	Feretia apodanthera (Del)	*4*	+	+	+
	Gardenia erubescens (Stapf)	*1*	+	+	+
	Gardenia ternifolia (K. Schum. and thom)	*2*	-	-	+
	Nauclea latifolia (Sm)	*2*	-	+	+
	Pavetta crassipes (K. Schum)	*1*	-	+	+
Sapotaceae	*Vitellaria paradoxa (Gaertn)*	*2*	+	-	+
Tiliaceae	*Grewia bicolor (Juss)*	*2*	+	-	-
Vitaceae	*Cissus populnea (G. and Perr)*	*2*	+	+	+
26	**72**		**56**	**48**	**49**

Legend: IS: Quality Index; F: Sonson dugukolo (Ferruginous); G: Bèlè dugukolo (Gravel-like); (A): Bira dugukolo (clay-sand); (+): Present; (-): Absent

3.1.3 Variation in the Contribution of the Main Families of Woody Fodder Plants According to Soil Type

Fig. 5 represents the contribution of the main families on the different soil types.

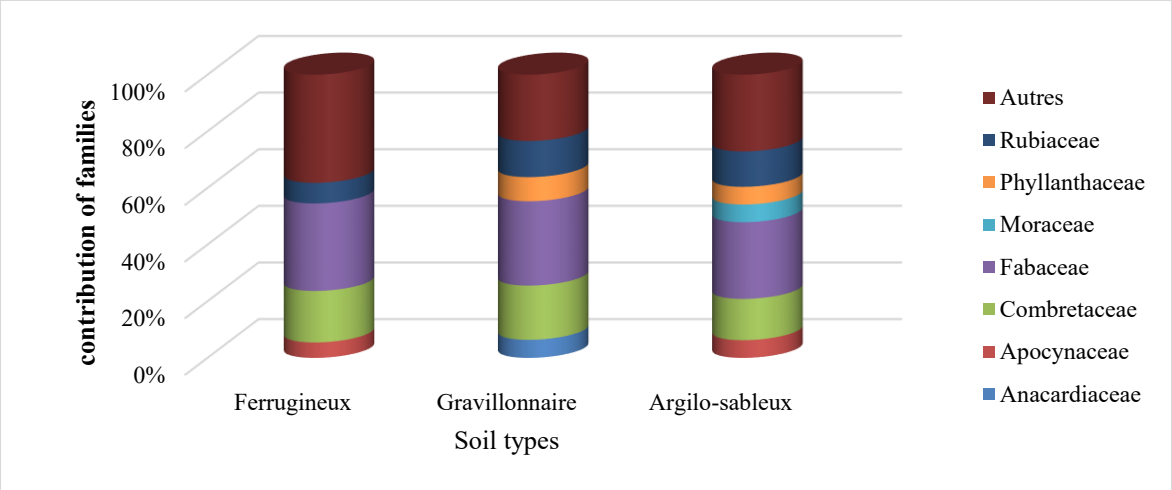

Fig. 5. Variation in contribution according to soil type

Analysis of Fig. 5 reveals that Fabaceae, Combretaceae, and Rubiaceae contribute to the floristic composition across all soil types. Apocynaceae are found specifically on ferruginous and gravelly soils, while Phyllanthaceae are present on both gravelly and sandy-clay soils. In contrast, Anacardiaceae and Moraceae appear only in limited numbers, respectively on gravelly and sandy-clay soils.

3.1.4 Variation of the Forage Spectrum According to Soil Types

Variation in forage spectrum according to soil types in the Madina Diassa ranch.

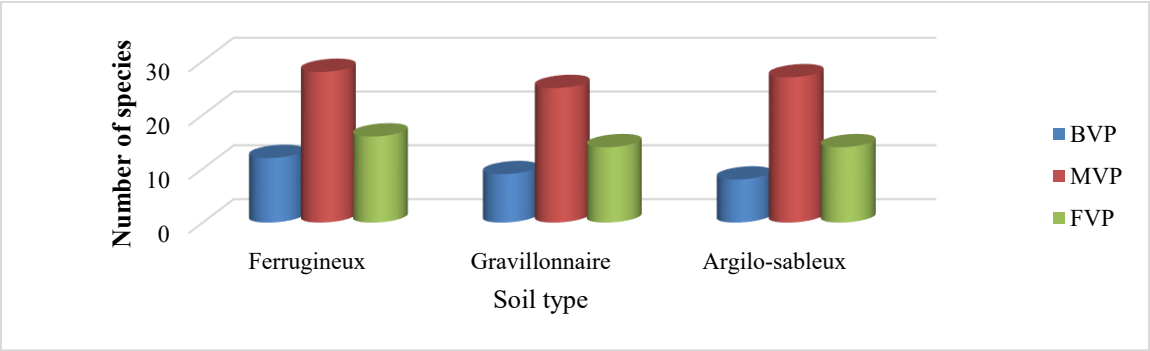

Fig. 6. Variation in forage spectrum according to soil type in the Madina Diassa ranch in Mali

Analysis of Fig. 6 shows that species with average pastoral value (MVP) are dominant on all soil types. However, other forage species (FVP, BVP) have exhibited fluctuating distribution across all soil types.

3.1.5 Evaluation of the Pastoral Value of Pastures

Fig. 7 This indicates the variation in pastoral value of the soil types studied on the pastures of the CCMD-BRE DE Madina Diassa.

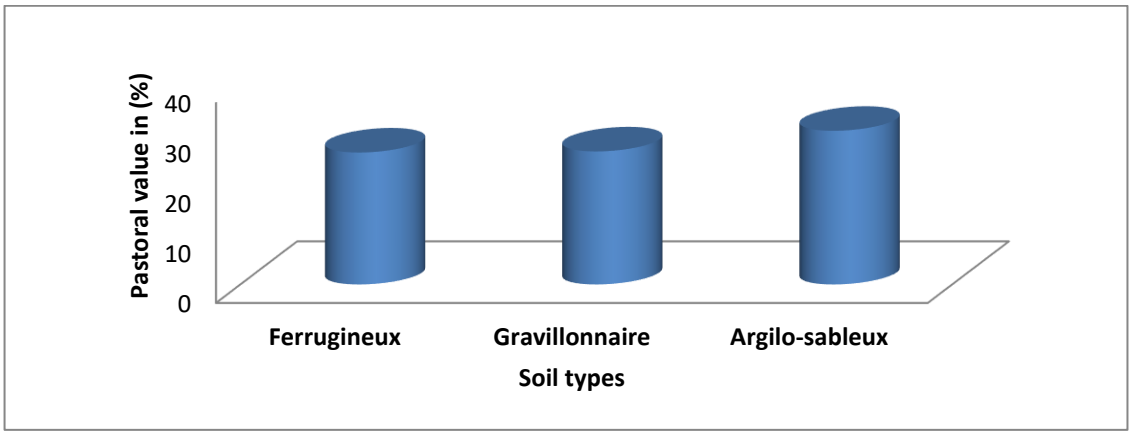

Fig. 7. Evolution of pastoral value according to soil type

Analysis of figure 7 highlights that the pastoral value remains below 50% across all soil types studied, reflecting overall limited forage productivity. The highest value is recorded on the clay-sand soil (30.73%), followed by the gravelly soil (26.60%), while the ferruginous soil shows a comparable level (26.39%). These results suggest a decisive influence of edaphic characteristics on the availability and quality of pastoral resources.

4. Discussion

4.1 Variation in Pasture Vegetation Cover

Vegetation cover on the ranch varies depending on the transect and soil type. Overall cover is greater on the Bira dugukolo (Clay-Sandy) soil (85%) than on other soil types sonson dugukolo (ferruginous) (71%), Bèlè dugukolo (Gravelly) (73%). This recovery trend was reported by Konate (2026).

This difference could be due to the nature of the soil. Our result is similar to that of Konate (2026), who found approximately 85% overall cover in his study on the characterization of gallery forests in the Falémé and Bafing regions of Kayes, Mali.

4.2 Woody Floristic Composition of Pastures

Woody floristic composition of the ranch's pastures consists of 78 species belonging to 61 genera and 27 families. This result is supported by the findings of Sanogo et al., (2024) in the district of Bougouni who has inventoried 44 species. The number of inventoried species is very less in the pastoral site of Domba, southwest of Mali, where 36 herbaceous species belonging to 31 genera and 14 families Kanambaye et al., (2025).

The main families to which the woody species of the CCMD-BRE pastures of Madina Diassa's belong findings indicate that the dominant woody plant families are, in order of importance, Fabaceae (27%), followed by Combretaceae (14%), Rubiaceae (9%), Moraceae (7%), and Phyllanthaceae and Apocynaceae (5%). These results are supported by those found by Traoré et al., (2022) illustrating that in west Sahel of Mali (District of Niono), the most important family of species was the fabaceae (9 species), followed by the combretaceae (5 species). According to Kanambaye et al., (2025), in the patoral site of Domba south-west of Mali, Poaceae (38%), and Fabaceae (11.11%) were the most dominant woody families.

By contrast, in the central of Senegal, the findings of Dione et al. (2020) reveal that ceasalpiniaceae with 24% and mimosaceae with 21% were the most represented families of wood species.

4.3 Contribution of Woody Species in Pastures

Woody pasture species in the CCMD-BRE contribute nearly 92.30% to woody forage production. Similar results were reported by Bakhoum et *al.,* (2020) and Dione et *al.* (2020). However, this result is similar to the 94.3% reported by Bakhoum et *al.,* (2020) after a study on the uses of woody fodder and pastoral practices in

the rural community of Téssékéré, Ferlo in Northern Senegal. However, it is higher than the 82.14% reported by Dione et *al.* (2020) after a study of the perceptions of agropastoralists and transhumant herders on woody fodder in central Senegal.

Highly palatable forage species represented 17%, moderately palatable species 51%, and poorly palatable species 32%. This result does not agree with that of Dione et *al.* (2020), who found 43.47% highly palatable species, 17.39% moderately palatable species, and 39.13% poorly palatable species in their study on the pastoral perception of woody forage plants by agropastoralists and transhumant herders in central Senegal, in the Kaffrine administrative region. It also does not agree with that of Konate (2026), who found approximately 40% of woody forage species to be highly palatable, followed by 18% for moderately palatable species and 42% for poorly palatable species.

4.4 Pastoral Value of Aerial Pastures

The pastoral value (27.85%) of the CCMD-BRE pastures of Madina Diassa is low overall. This low pastoral value of the study area could be explained by high grazing pressure and the harvesting of woody fodder trees. However, results results from Sanogo et al., (2024) in the south west of Mali, have illustrated that the pastoral values were are 54.04% in Koumantou and 69% in Faragouaran.

These results are sharing similarities with those of Konare and Coulibaly, (2019) in the rural commune of Dabia (south of Mali) illustrating that the pastoral value was fluctuating from 35 to 64.61% between silty-sandy soils vegetation and vegetation on leathery knoll soils.

In Niger at the Sahelian experimental station of Toukounous, this pastoral value was seen as higher with 87.5% from June to September (Saidou et al., 2010).

5. Conclusion

The highest cover values are in the woody layer (58.33%) and the herbaceous layer (53.33%), while the lowest values are observed in the tree (37.22%), shrub (20.83%) and low woody (11.66%) layers.

The woody flora of the CCMD-BRE pastures of Madina Diassa boasts a remarkable floral diversity, with 72 recorded forage species, representing 92.30% of the total. Their distribution varies according to soil type: 56 species on the Sonson River. dugukolo (ferruginous), 49 on the Bira dugukolo (clay-sandy) and 48 on the Bèlè dugukolo (gravel). The dominant families are Fabaceae, Combretaceae, Rubiaceae, Apocynaceae Moraceae and Phyllanthaceae.

The pastoral value remains below 50% across all soil types. It reaches a maximum on clay-sand soil (30.56%), followed by gravelly soil (26.60%) and ferruginous soil (26.39%). The analysis thus highlights a significant difference between the three soil types.

Disclaimer (Artificial Intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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Competing Interests

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

References

Akpo, E. L., Masse, D., & Grouzis, M. (2000). Valeur pastorale de la végétation herbacée des jachères soudaniennes (Haute-Casamance, Sénégal). In C. Floret & R. Pontanier (Eds.), *La jachère en Afrique tropicale: Rôles, aménagement, alternatives: 1. Actes du séminaire international, Dakar, 13–16 avril 1999* (pp. 493–502). IRD; J. Libbey. https://horizon.documentation.ird.fr/exl-doc/pleins_textes/divers10-01/010024602.pdf

Alhassane, A., Soumana, I., Chaibou, I., Karim, S., Mahamane, A., & Saadou, M. (2018). Productivity, pastoral value and carrying capacity of natural rangelands in the Maradi Region, Niger. *International Journal of Biological and Chemical Sciences*, *12*(4), 1705. https://doi.org/10.4314/ijbcs.v12i4.15

Arbonnier, M. (2000). *Trees, shrubs and lianas of West African dry zones*. IUCN; CIRAD; MNHN. https://coilink.org/20.500.12592/hj2n8t

Bakhoum, A., Sarr, O., Ngom, D., Diatta, S., & Ickowicz, A. (2020). Usages des fourrages ligneux et pratiques pastorales dans la communauté rurale de Téssékéré, Ferlo, Nord Sénégal. *Revue d'élevage et de médecine vétérinaire des pays tropicaux*, *73*(3), 191–198. https://doi.org/10.19182/remvt.31890

Boudet, G. (1979). Quelques observations sur les fluctuations du couvert végétal sahélien au Gourma malien et leurs conséquences pour une stratégie de gestion sylvo-pastorale. *Bois et Forêts des Tropiques*, (184), 31–44. https://doi.org/10.19182/bft1979.184.a19389

Camara, Y., Sissokho, M. M., Sall, M., Farnir, F., & Antoine-moussiaux, N. (2020). Programmes de sélection du bovin N ' Dama en Afrique de l ' Ouest : cas du Sénégal , du Mali et de la Gambie. *Cahiers AGRICULTURES*, 1–9. https://doi.org/10.1051/cagri/2020010

Cissé, A. M. (1986). *Dynamique de la strate herbacée des pâturages de la zone sud-sahélienne* [Dynamics of the herbaceous stratum of pastures in the South-Sahelian zone] (Doctoral thesis). Wageningen Agricultural University. http://library.wur.nl/WebQuery/clc/242102

Daget, P., & Poissonnet, J. (1971). A method of phytological analysis of grasslands. Application criteria. *Annales Agronomiques*, *22*(1), 5–41.

Diarra, F, S. (2010). *Evaluation of the contribution of native fodder trees and shrubs to the socio-economic well-being of farmers in the Koutiala region of Mali* (Master's thesis in agroforestry). Laval University, Quebec (Canada). https://corpus.ulaval.ca/entities/publication/b0eddf73-fce6-43a9-bb11-269f66f86888

Diarra, B. (2020). Les changements climatiques au Mali et impacts | Climate Change and Its Impacts in Mali. In I. N'Diaye et al. (Eds.), Adaptation de l'Agriculture et de l'Élevage au Changement Climatique au Mali: Résultats et leçons apprises au Sahel (pp. 15-34). Institut d'Economie Rurale. https://hdl.handle.net/11250/2687372

Dione, A., Sarr, O., Ngom, S., Diallo, A., & Guisse, A. (2020). Pastoral perceptions of fodder ligneous by agro-pastoralists and transhumants in central Senegal. *International Journal of Biological and Chemical Sciences*, *14*(3), 772–787. https://doi.org/10.4314/ijbcs.v14i3.11

Coulibaly, D. (2022). Rapport technique Mali.79p.

Gounot, M. (1969). *Méthodes d'étude quantitative de la végétation*. Masson.

Institut national de la statistique (INSTAT). (2015). Enquête Modulaire et Permanente auprès des Ménages (2015).

Kanambaye, B., Karembe, M., Coulibaly, D., Hanan, N., Dembele, F., Diallo, S., & A. Maiga, A. H. (2022). Détermination du Potentiel Pastoral Herbacé de la Commune Rurale de Dièma dans le Bioclimat Soudanien Nord au Mali. *European Scientific Journal, ESJ*, *18*(33), 165–181. https://doi.org/10.19044/esj.2022.v18n33p165

Kanambaye, B., Ballo A., Traore, S., And Sanogo, T. 2025. "Assessment of Herbaceous Pastoral Resources in the Domba Pastoral Site, Bougouni Region, Mali". *Asian Journal of Biology* 21 (11):55-63. https://doi.org/10.9734/ajob/2025/v21i11572

Konate, O. B. (2026). Caractérisation des galeries forestières de la Falémé et du Bafîng dans la région de Kayes au Mali. Amazon Digital Services LLC - Kdp.

Konare, D., Coulibaly, M., 2019. « Evaluation des Impacts de la Transhumance sur les Ressources Pastorales au sud du Mali dans la Commune Rurale de Dabia (Cercle de Kéniéba) ».*European Scientific Journal ESJ*, *15*(21) pp. 202-227.

Ngom, D, A., Diatta, S., & Akpo, L. E. (2012). Qualité pastorale des ressources herbagères de la réserve de biosphère du Ferlo (Nord-Sénégal). *International Journal of Biological and Chemical Sciences*, *6*(1), 186–201. https://doi.org/10.4314/ijbcs.v6i1.17

PROGEBE. (2015). Effects of Transhumance on the Management of Endemic Ruminant Genetic Resources in Progebe Zone (the Gambia , Mali , Senegal , Guinea). *International Trypanotolerance Centre*, 1–71. https://openknowledge.fao.org/bitstreams/fc3edbef-b95b-4a23-abda-07db830ec08a/download

Saidou, O., Douma, S., Djibo, A. Z., & Fortina, R. (2010). Analyse du peuplement herbacé de la station sahélienne expérimentale de Toukounous (Niger) : Composition floristique et valeur pastorale. Sécheresse, 21(2), 154–160. https://doi.org/10.1684/sec.2010.0243

Sanon, H. O., Savadogo, M., Tamboura, H. H., & Kanwé, B. A. (2014). Caractérisation des systèmes de production et des ressources fourragères dans un terroir test de la zone soudanienne du Burkina Faso. *VertigO*, *Volume 14 Numéro 2*, 1–15. https://doi.org/10.4000/vertigo.15171

Traore, F, S., Karembe, M., Soumana I., Togola, I., Mahamane, A., 2022. « Caractérisation des formations naturelles à Acacia senegal (L) Willd dans l'Ouest du Sahel malien, Nioro». *Journal of Environmental Science, Toxicology and Food Technology*, *16*(4), pp. 20–28. DOI:10.9790/2402-1604012028

Sanogo, T, Sokemawu, K., Karembe, M., Biber-Freudenberger Lisa. (2024). Assessing Pastoral Potential Feed Resources and the Effect of Invasive Unpalatable Species on Pastures in The District of Bougouni, Southwest Of Mali. *Revue Ivoirienne de Géographie Des Savanes*, 79–103. https://riges-uao.net/wp-content/uploads/journal/published_paper/volume-16/issue-1/tAW5mQNM.pdf

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