



Biomass production and nutritional value of natural rangelands under two management systems in northern Benin

Sèwanou Frimence A. Tossou¹, Eva Schlecht², Rodrigue V. Cao Diogo¹

¹Integrated Production System Innovation Lab and Sustainable Land Management (InSPIRES SLM), Faculty of Agronomy, University of Parakou, BP 123 Parakou, Benin

²Animal Husbandry in the Tropics and Subtropics, University of Kassel, Steinstrasse 19, Witzenhausen D-37213, Germany

UNIKASSEL
VERSITÄT



Tropentag 2026

16-18 September



Introduction

- As rangelands decline, grazing pressure intensifies, leading to changes in vegetation composition and affecting forage supply.
- Although transhumance historically mitigates seasonal forage variability, Benin's pastoral policies promote herd sedentarization.
- This eases conflicts but puts grazing pressure on communal rangelands without proper management.

Study aim

Assess the herbaceous community structure, biomass production, and nutritional quality of rangelands under sedentarized and semi-mobile management systems in northern Benin.

Methods



Sites: 4 villages in northern Benin (Fig. 1)

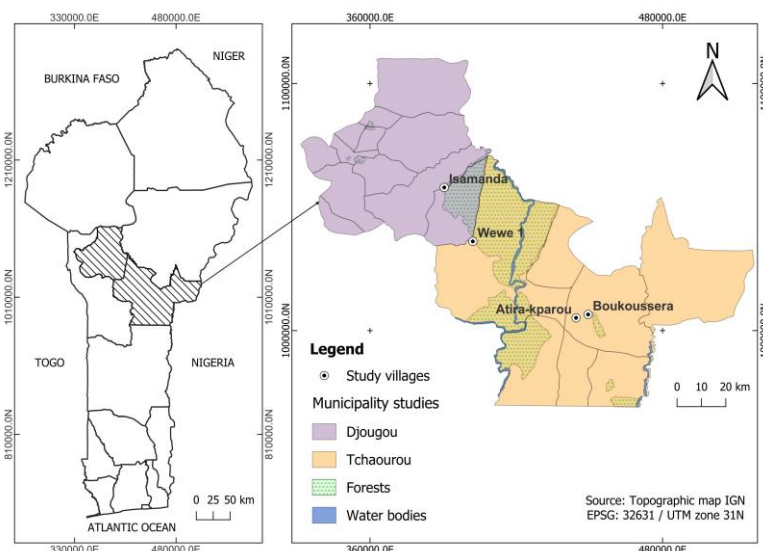


Fig. 1. Map of the 4 study sites (right) within the map of Benin (left)

Period



- July 2023 to November 2023 (early, mid, and late rainy season)
- June 2024 to October 2024 (early, mid, and late rainy season)



Approach

- Repeated identification of dominant herbaceous species on 20 selected rangelands
- Assessment of biomass yield and quality by analysis for DM, OM, N, P, C, Ca, NDF, and ADF



Data analysis

- R software

Conclusion

- Herbaceous community structure varies across management systems and the rainy season.
- N, P, and C are higher in the sedentarized system despite higher biomass yield in the semi-mobile one.
- High biomass does not necessarily induce high forage quality.

Results & Discussion

- Eighty-one herbaceous plant species belonging to 19 families were recorded, with Poaceae, Fabaceae, and Cyperaceae representing the largest proportions (26%, 20%, and 19%).
- Rangelands in the semi-mobile system yielded significantly more biomass ($p=0.001$) than those in the sedentarized system (Fig. 2).

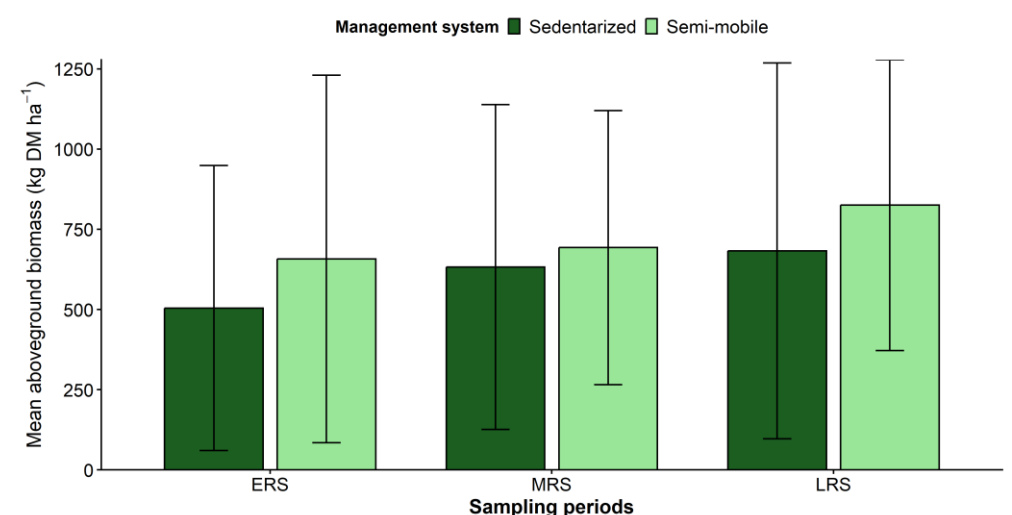


Fig. 2. Mean aboveground biomass production (kg DM ha⁻¹) in two management systems across rainy season periods. ERS | Early Rainy Season, MRS | Mid Rainy Season, LRS | Late Rainy Season. Error bars represent standard deviations

- Higher concentrations of nutrients were observed in the biomass of the sedentarized system (Table 1).

Table 1. Univariate ANOVAs for individual (mean $\pm$ SE) forage quality traits

Variable	Sedentarized	Semi-mobile	p-value
ADF (% DM)	42.6 $\pm$ 0.22	42.3 $\pm$ 0.24	0.397
NDF (% DM)	62.4 $\pm$ 0.28	63.0 $\pm$ 0.34	0.1576
N (g kg ⁻¹ DM)	12.9 $\pm$ 0.17	11.6 $\pm$ 0.17	<0.001
C (g kg ⁻¹ DM)	395.0 $\pm$ 1.71	409.0 $\pm$ 1.41	<0.001
Ca (mg g ⁻¹ DM)	9.35 $\pm$ 0.21	9.09 $\pm$ 0.18	0.336
P (mg g ⁻¹ DM)	1.46 $\pm$ 0.04	1.35 $\pm$ 0.04	0.038

ADF: Acid Detergent Fiber, NDF: Neutral Detergent Fiber, N: Nitrogen, C: Carbon, Ca: Calcium, P: Phosphorus

DecLaRe is coordinated by the University of Kassel:

declare_kassel@uni-kassel.de. Funding: BMBF, ID: 100537724

Umbrella programme "Sustainable land management in sub-Saharan Africa: Improving livelihoods through on-the-ground research"

Decision support for strengthening land resilience in the face of global challenges;
www.uni-kassel.de/forschung/declare/home

