



Effects of Transhumance and Vegetation Type on Soil Quality of Rangelands in Northern Benin



Rodrigue V. Cao Diogo¹, Luc Hippolyte Dossa², Pénélope G.T. Gnavo¹,
Eva Schlecht³, Andreas Buerkert⁴

¹University of Parakou, Department. of Science and Technics of Animal Production and Fisheries, Benin

²University of Abomey-Calavi, Faculty of Agricultural Sciences, School of Science and Technics of Animal Production, Benin

³University of Kassel / Georg-August-Universität Göttingen, Animal Husbandry in the Tropics and Subtropics, Germany

⁴University of Kassel, Organic Plant Production and Agroecosystems Research in the Tropics and Subtropics, Germany

Introduction and Objectives

- Long-distance cattle transhumance (Fig. 1) is a widespread dry season phenomenon across West Africa. However, transhumant herds may degrade the environment, although the dungs deposited (Fig. 2) may improve soil health and the ecology of rangeland soils.
- To elucidate this further, the effects of two grazing intensities and three vegetation types (VT) were evaluated on soil quality of rangelands in two municipalities of northern Benin.

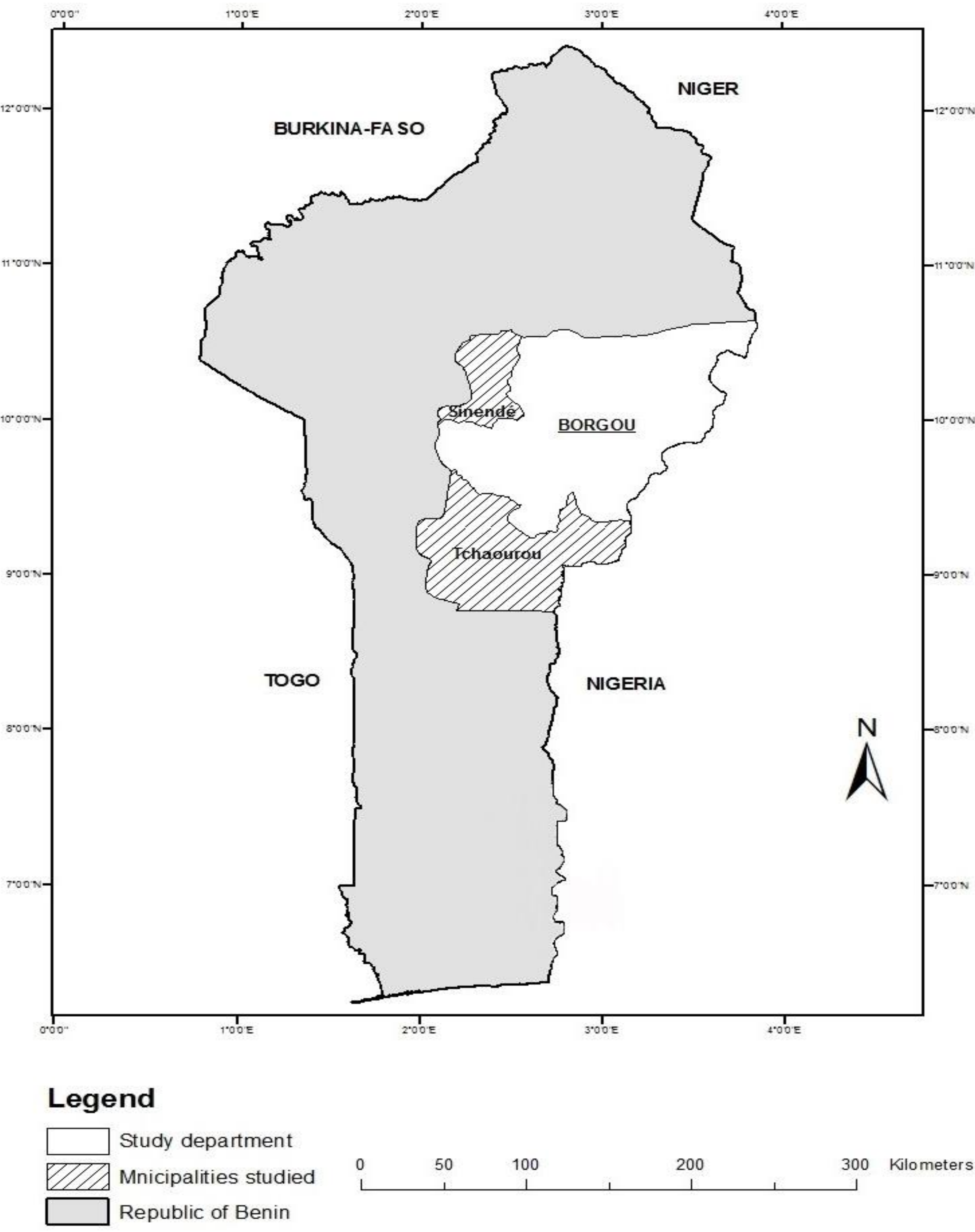


Figure 3: Map of Benin showing the study sites.

Sites

- The municipalities of Sinendé and Tchaourou in northern-Benin (Fig. 3), two host areas for cross-border cattle transhumance were chosen.
- The three representative VT of these locations were: Open forest/woodland savannah; wooded savannah/shrub savannah and crop field mosaic.
- Strong (ST) and weak (WT) transhumance zone were delineated with local community help and based on existing transhumance maps.



Figure 4: Determination of soil compaction using a penetrometer.

Of/Ws: Open forest/woodland savannah

Ws/Ss: wooded savannah/shrub savannah

Cfm: Crop field mosaic

OM: Organic matter content

TZ: Transhumance zone

VT: Vegetation type

ST: Strong transhumance

WT: Weak transhumance



Figure 1: Cattle on natural rangeland (Sinendé).

Methodology

- 90 soil samples were collected from 90 randomly selected plots of 100 m² (30 in ST and 15 in WT zones in each municipality) in 5 different spots of 1 m² using an auger.
- The composite soil samples were analyzed for texture, pH and organic matter contents. Soil compaction was monitored through a penetrometer (Fig. 4) driven at 5 cm depth which showed the pressure exerted on the soils.



Figure 2: Cattle dungs deposited on natural rangeland.

Results

Table 1: Effects of transhumance zone and vegetation type on selected soil properties of rangelands in northern Benin

Variables	ST	WT	Cfm	Of/Ws	Ws/Ss	VT	TZ	TZ x VT
Pressure (t/m ²)	183.2 ± 83.61	145.4 ± 46.65	145.3 ± 70.16	151.75 ± 63.06	196.6 ± 67.08	*	**	NS
OM (%)	2.1 ± 0.91	2.2 ± 0.66	2.1 ± 0.66	2.7 ± 0.72	1.7 ± 0.77	***	NS	NS
pH	6.6 ± 0.66	6.3 ± 0.55	6.4 ± 0.51	6.4 ± 0.72	6.5 ± 0.69	NS	NS	NS

NS: Not Significant; *** P ≤ 0.001, ** P ≤ 0.01, * P < 0.05 ANOVA test.

- Soils pH was neither affected by vegetation type nor by transhumance.
- The organic matter content was similar across transhumance zone, but varied across vegetation type.
- Soil compaction was significantly affected by vegetation type and transhumance.
- This reflects a strong pressure exerted by cattle on the soil.

Conclusion

- Transhumance affects soil compaction but does not affect its fertility.
- Moving herds strategically from one pasture to the other, may help decrease rangeland soil degradation, and improve its quality and productivity.

- Further studies must evaluate the appropriate carrying capacity of rangelands to avoid soil compaction while taking advantage of the dungs deposited for soil health improvement.

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