Do transhumance and/or vegetation types affect the productivity of natural rangelands in Benin?

Rodrigue V. Cao Diogo[1], Luc Hippolyte Dossa[2], Pénéloppe G.T. Gnavo[1], Eva Schlecht[3], Andreas Buerkert[4]

[1]University of Parakou, Department of Science and Technics of Animal Production and Fisheries, Benin
[2]University of Abomey-Calavi, Faculty of Agricultural Sciences, School of Science and Technics of Animal Production, Benin
[4]University of Kassel / University of Göttingen, Animal Husbandry in the Tropics and Subtropics, Germany
[5]University of Kassel, Organic Plant Production and Agroecosystems Research in the Tropics and Subtropics, Germany

Introduction and Objectives

- In Benin, cattle production is the main source of meat and milk products, and natural rangelands are the basis and most often the only provider of feed resources. On-going climate change and overexploitation of natural resources have resulted in the reduction of grazing areas in the country. North-east Benin accounts for 67% of the cattle population and cattle rearing is increasingg in the South. This may lead to heavy pressure on grazing land and hinder recovery of natural vegetation.
- Transhumance reportedly induces a loss of species diversity of the natural vegetation in various agroecosystems. However, this effect could be more complex as reported. Therefore, this study evaluated the effect of transhumance and of vegetation types on plant diversity and biomass loss in three agro-ecological zones (AEZ) of Benin.

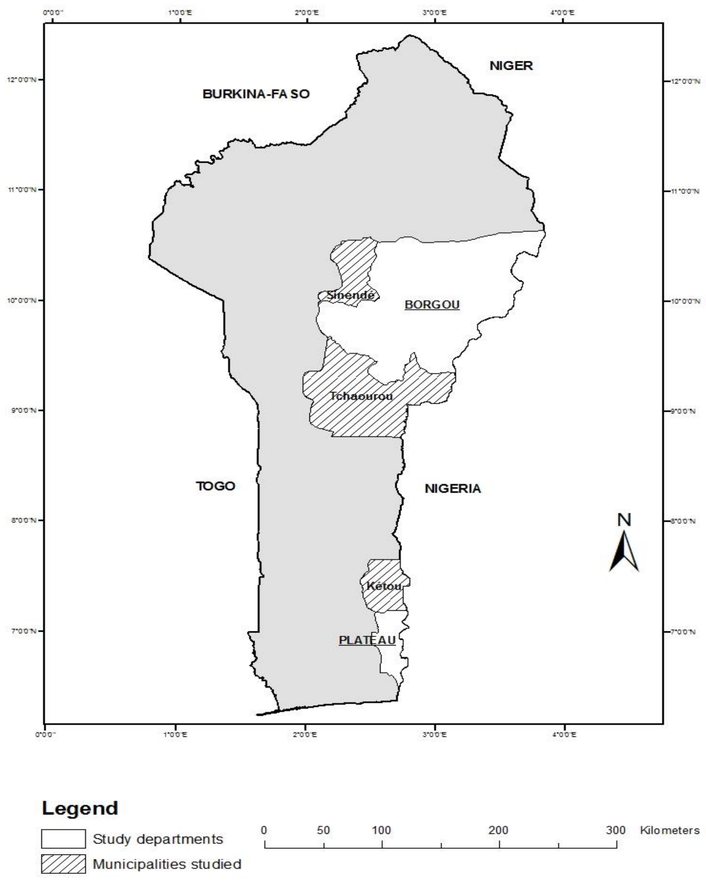

Figure 1. Location of the study sites in Benin.

Research Sites

- Three sites in three AEZ of Benin: Sinendé (Sudanian), Tchaourou (Sudano-Guinean) and Kétou (Guinean) were studied (Figure 1).
- The three main vegetation types of the sites were: (i) Open forest/savannah (Of/Ws), (ii) Wooded savannah/shrub savannah (Ws/Ss), and (iii) Crop field mosaics (Cfm).
- Two zones of different intensity of transhumance (IT) namely strong transhumance (ST: strong frequentation of animals) and weak transhumance (WT) zone were delineated based on existing transhumance maps and community knowledge (on presence of livestock corridors, presence of animal concentration camps or night parks).

Methodology

- **Sampling:** 30 randomly distributed sampling spots across ST areas and 15 in WT zones of each AEZ.
- **Pasture inventory and vegetation diversity:** a 900 m^2 plot (30m x 30m) was delineated per site in which five plots of 1 m^2 were installed on the diagonals (one at each 4 corners of the square plus one in the center). The herbaceous species that fell within the 1 m^2 plot were recorded as well as the number of individuals per species (phyto-sociological survey method by Braun-Blanquet,1932)
- **Biomass produced**: a cut at ground level of the aerial parts of grasses and forb species plants was carried out in the five 1 m^2 plot described above per site.

Results

Table 1. Effects of IT and VT on plant diversity and forbs and grass biomass in three agro-ecological zones of Benin.

	Parameters	IT	VT	AEZ	IT x VT	IT x AEZ	VT x AEZ	IT x VT x AEZ
Overall	RS / m^2	NS	***	***	NS	***	***	***
	H' means in bits/m^2	NS	*	***	**	***	***	***
	J' means in bits/plot	NS	*	***	NS	***	***	**
	Total biomass (kg DM/m^2)	NS	NS	***	NS	***	***	***
	Grass biomass (kg DM/m^2)	NS	**	***	*	***	***	***
	Forb biomass (kg DM/m^2)	NS	NS	***	NS	***	***	***

NS: Not significant, *** P ≤ 0.001, ** P ≤ 0.01, * P< 0.05 ANOVA or Kruskal-Wallis test

RS: Species Richness
H': Shannon index
J': Pielou index
IT: Intensity of Transhumance
VT: Vegetation Type
AEZ: Agro-Ecological Zone

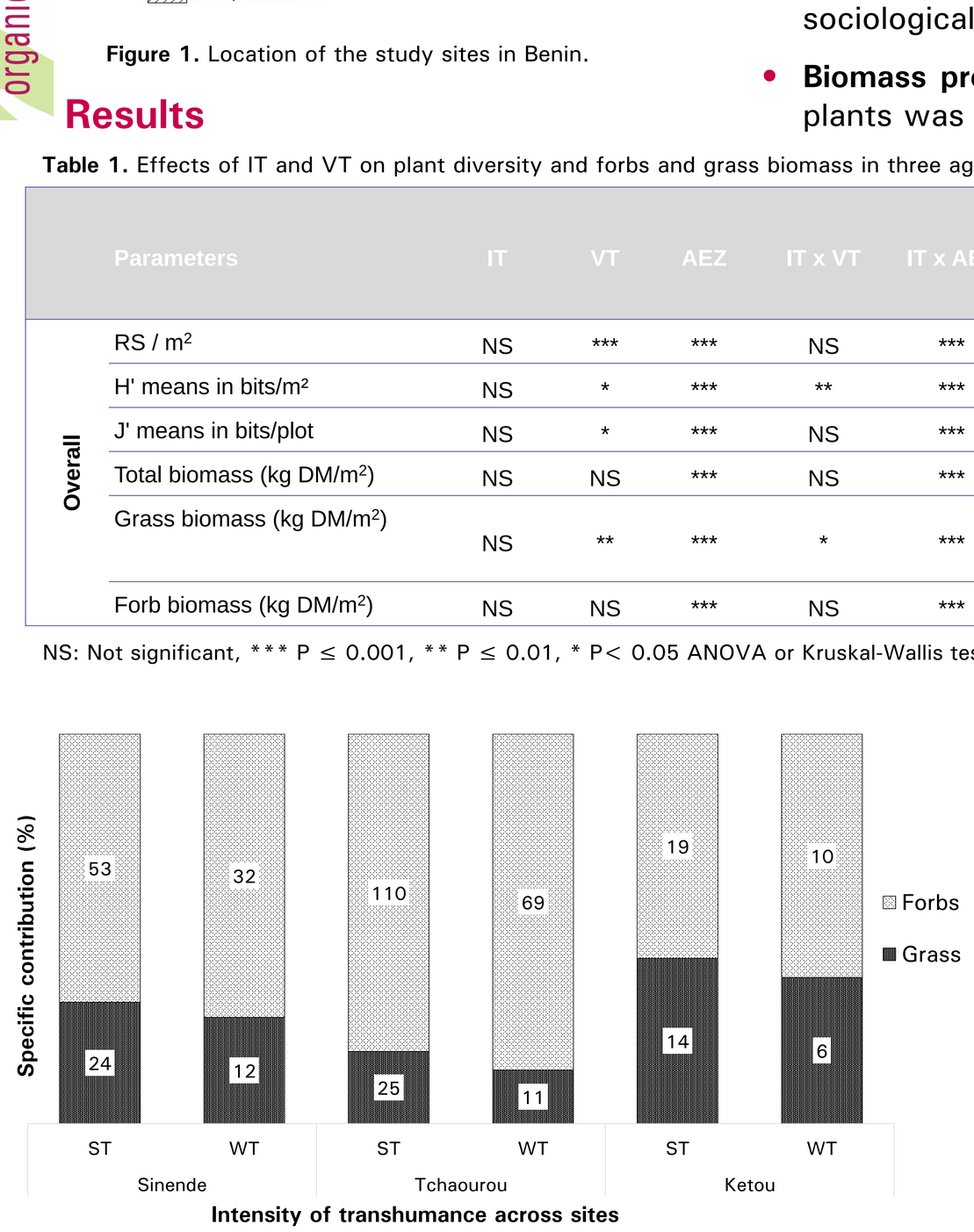

Figure 2. Specific contribution and proportion of grasses and forbs in strong (ST) and weak (WT) transhumance intensity in the Sudanian (Sinendé), Sudano-Guinean (Tchaourou) and Guinean (Kétou) zone of Benin.

Figure 3. Transhumant cattle in northern (up) and southern (down) Benin.

Conclusions

- Plant diversity and biomass production were not *per se* affected by intensity of transhumance (IT). However, vegetation type (VT) and agro-ecological zone (AEZ) played a key role due to their combined effect (Table 1).
- The biomass produced resulted from the combined effect of the IT, VT and AEZ (Figures 2 + 3).
- Pastoral transhumance alone has no direct effect on the floristic composition on the studied natural rangeland and is thus no major driving force of plant biodiversity loss across different AEZ of Benin.
- Further long term studies are needed to evaluate the effect and seasonality of transhumance on natural rangeland studied.

Acknowledgements

We are grateful to the Volkswagen Foundation, Hannover, Germany for funding this research and to the local communities for facilitation of the study.