Cattle corralling strategies for soil management in northern Benin: Benefits, constraints, and determinants

Awouminassi Marcellin Atakoun[1], Rodrigue V. Cao Diogo[2], Pierre Gbenoukpo Tovihoudji[3], Nicolas Kyei-Bafour[4], Boateng Kyereh[5]

1 Kwame Nkrumah University of Science and Technology, Dept. of Civil Engineering, Ghana // 2 University of Parakou, Dept. of Sci. and Techn. of Animal Prod. and Fisheries, Benin // 3 University of Parakou, Dept. of Crop Production / Lab. of Hydraulics and Environmental Modeling (HydroModE Lab), Benin // 4 Kwame Nkrumah University of Science and Technology, Dept. of Agricultural Engineering, Ghana // 5 Kwame Nkrumah University of Science and Technology, Dept. of Silviculture and Forest Management, Ghana

**Corresponding author. Tel.: +229 66167671; E-mail address: atakoun.a@edu.wascal.org*

Introduction and objectives

- Developing integrated systems to manage soil fertility in the context of climate change has become a priority for our generation.
- This study examined the benefits, constraints, and factors that determine the adoption of cattle corralling practices in maize-based farming systems. The study answers the following questions:
- (i) what socio-demographic factors determine the different cattle corralling types adoption in rural Northern Benin? and,
- (ii) how the benefits and constraints of cattle corralling practices are perceived among smallholder farmers?

Materials and methods

Study zone

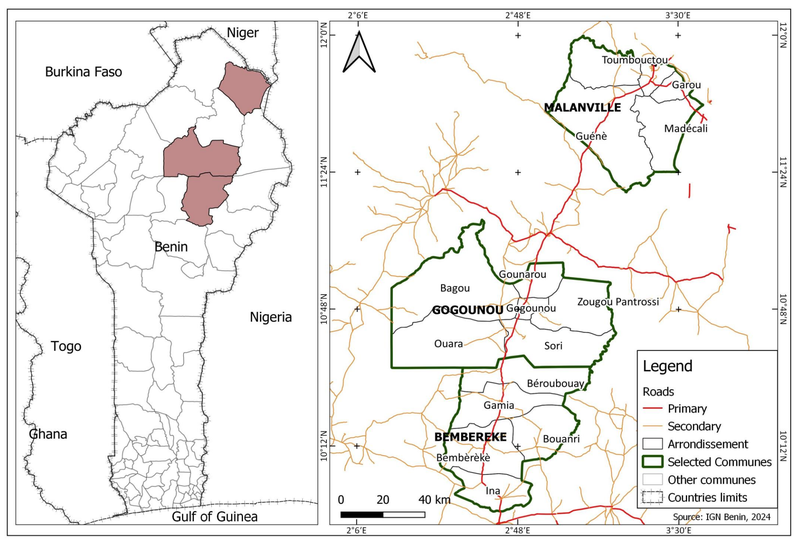


Fig. 1. Location of household surveys.

- **Gogounou municipality** (Region of Alibori), **Bembereke municipality** (Region of Borgou), and **Malanville municipality** (Region of Alibori).
- **Soils:** Lixisols (FAO classification)
- **One rainy season:** May-October
- **Mean annual rainfall:** 900 and 1200 mm
- **Mean annual temperature:** 27.5 °C

Household survey and Data collection

- Surveys households of smallholder farmers across three agroecological zones of Northern Benin for data collection.

Dagneli (1998) : **392 sample**

KoBo toolbox

- A- Demographic and socio-economic characteristics of the household
- B- Farm management, production method, and production objectives
- C- Cattle corralling practice

Analysis

✓ The descriptive statistic,
✓ Factorial Analysis of Correspondence (FAC) followed by an Ascending Hierarchical Classification (AHC),
✓ The binary model equation is presented as follows: **Yi = Xi β + εi**, Where:

- **Yi** is the variable that takes the value **1** if the farmer adopts cattle corralling and **0** if they do not adopt it; **Xi** is the set of explanatory variables; **β** represents the vector of coefficients associated with the explanatory variables Xi; **εi** is the standard error.

Results

Characteristics and benefits of cattle corralling practices in northern Benin

Variables	Modalities	Study zone N (%)
Corralling awareness	No	11.5
	Yes	88.5
Adoption level	No	29.1
	Yes	70.9
Manure spread after corralling	No	48.7
	Yes	51.3
Corralling Method	Overnight	26.8
	Rotative	43.6
	Rotative/Overnight	15.6
	Corralling contract	14.0
Corralling Location	Field away from home	21.9
	Fields near the house	50.5
	No preference	27.6

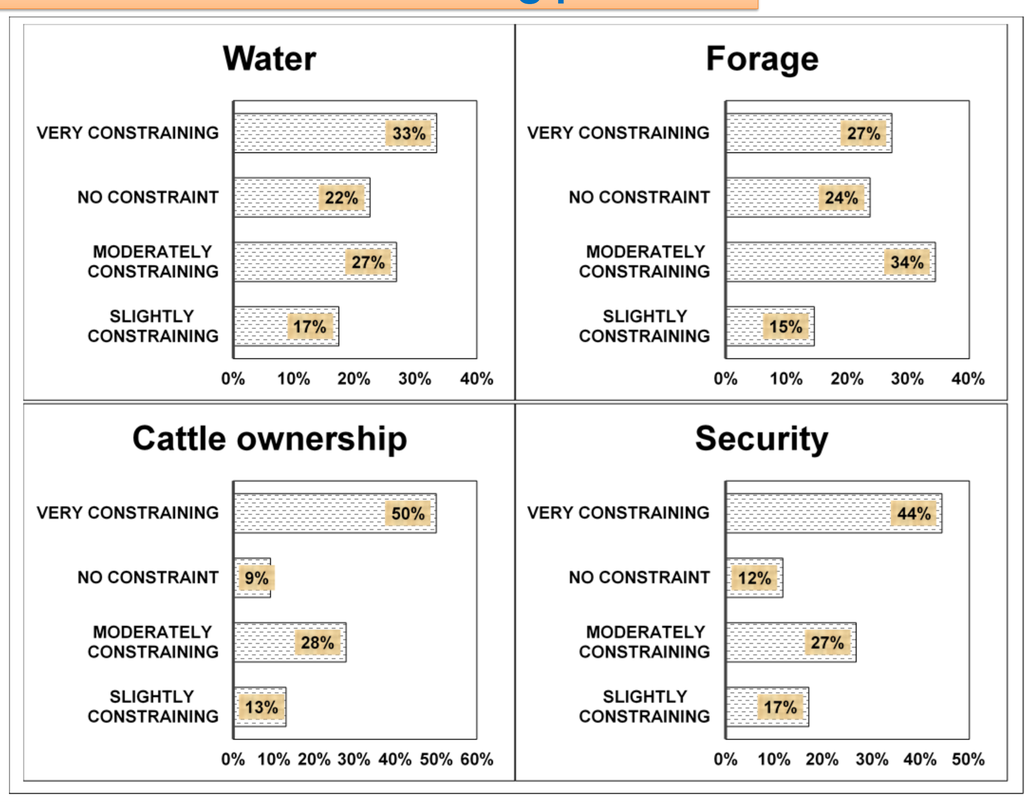
88.5% awareness, and 70.9% adoption level

cattle corralling every year (74%), every 2 years (9%), and every 3 years (3%).

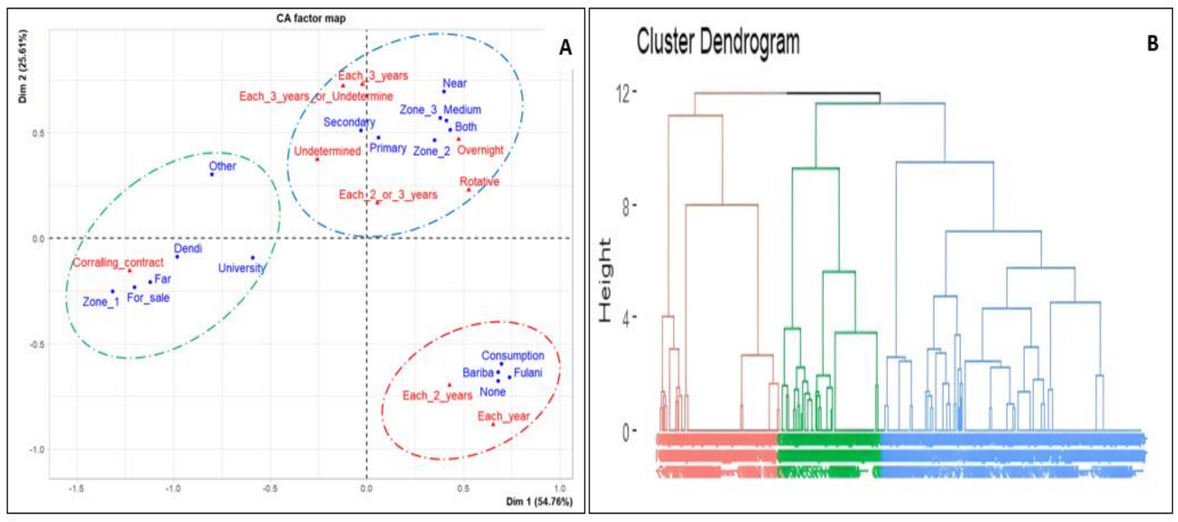
55.54 ± 1.93 average number of cattle that can corral one hectare,

corralling period average was 3.44 ± 0.1 weeks.

constraints of cattle corralling practices



Typology of cattle corralling practices



✓ Continuous Overnight-Rotational Corralling (CORC)
✓ Discontinuous Overnight-Rotational Corralling (DORC)
✓ Corralling contract (CC)

Determinants of the adoption of the practice of cattle corralling

Variable	Modality	B	Sig.	Model Evaluation
Agroecological zone	Zone 1	0.46	0.000***	70.90
	Zone 2	-1.39	0.000***	
Educational level	None	2.24	0.000***	74,2
Ethnicity	Bariba	3.41	0.000***	72,2
	Other	2.60	0.000***	
Access to Credit	Yes/No	0.65	0.004**	70.90
Awareness of corralling	Yes/No	3.65	0.000***	80.40
Access to extension services	Yes/No	-1.75	0.000***	73.20
Distance fields-house	Far	0.74	0.000***	75.80
	Medium	-2.68	0.000***	
	Near	2.15	0.000***	
Breeding mode	Sedentary	1.56	0.000***	70.90
	Semi-Sedentary	-3.23	0.001***	
Production objective	Both	0.56	0.000***	95.90
	For sale	5.58	0.000***	

Conclusions

- **Typology:** shaped by local socio-economic and environmental factors, suggests that tailored strategies can effectively address the unique challenges faced by different farming communities.
- **Determinants:** targeted interventions can be designed to promote the widespread adoption of cattle corralling, thereby enhancing soil fertility and resilience against climate variability.
- **addressing the identified constraints** is the potential to optimize these practices, leading to more sustainable agricultural systems and improved livelihoods for farmers.