Characterization of shea tree and maize agroforestry parklands in northern Benin

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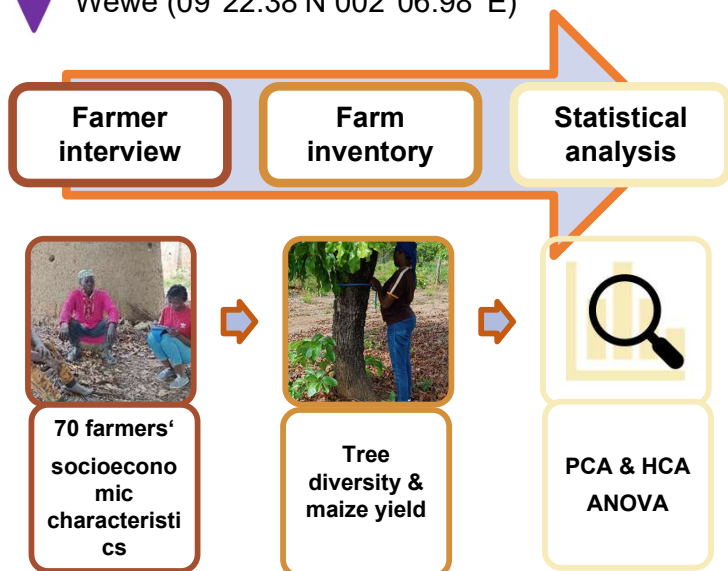
Introduction

In northern Benin maize (*Zea mays* L.) is an important staple crop grown in association with scattered shea trees (*Vitellaria paradoxa* C. F. Gaertn, Fig. 1). The performance of these shea-maize agroforestry parklands depends on different management strategies such as input use, tree structure, and species composition. This study aims to characterize maize agroforestry parklands to formulate sustainable management strategies.

**Figure 1**. Maize stand in shea tree agroforestry parkland systems of Benin.

Materials and Methods

Boukoussera (09°06.25'N 002°31.79'E)
Wewe (09°22.38'N 002°06.98' E)

Farmer interview → **Farm inventory** → **Statistical analysis**

70 farmers' socioeconomic characteristics → **Tree diversity & maize yield** → **PCA & HCA ANOVA**

Results & Discussion

Using 19 variables for the HCA led to segregation of maize-shea agroforestry into 3 groups. Most farms were classified into Group 1 (13 farms), followed by Group 2 (16 farms) and Group 3 (41 farms).
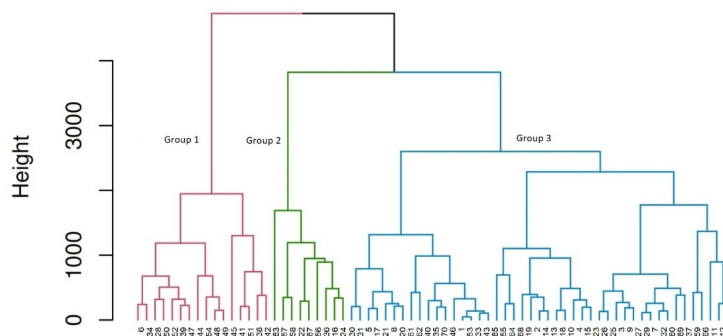
Figure 2. Hierarchical clustering of shea-maize agro-forestry parklands in Benin.

- Average tropical livestock units (TLUs) of parklands in Group 1 and 2 was 30-times lower than of parklands in Group 3. This is because the majority of farmers classified in Group 3 were Fulani whose livelihoods solely depend on farming (Table 1, Fig. 2).

- Application of mineral fertilizers in Group 1 parklands was 488% and 884% higher than in Group 2 and 3, respectively. Consequently, grain yields in parklands of Groups 2 and 3 were 49% and 22%, respectively, lower than in Group 1 parklands.

- Average tree density and richness in Group 1 and 2 parklands were 3 and 2-fold, respectively, lower than in parklands of Group 3.

Table 1. Comparison of three shea-maize agroforestry parklands in Benin.

	Groups			SEM
	1	2	3	
Tropical livestock unit (TLU)	0.0 c	0.4 b	11.9 a	1.2
Herbicide (l ha^{-1})	0.4 b	2.8 a	1.4 ab	0.2
Fertilizer (kg ha^{-1})	312 a	53.1 b	31.7 b	20.2
Grain yield (kg ha^{-1})	3728.0 a	1911.0 b	2925.0 b	110.8
Tree density (no. ha^{-1})	5.9 b	4.0 b	13.2 a	1.4
Tree richness (no.)	4.8 b	3.0 b	7.3 a	0.4

Means along the same rows with different alphabets are significantly different at ($p < 0.05$). SEM demotes the overall standard error of the mean.

Conclusions

There is a large variability among shea-maize agroforestry parklands in northern Benin hence policies to promote sustainable intensification must be targeted according to each group's needs.