Farmers' Preferences for Adopting Agroforestry in the Eastern Drylands of Rwanda

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1. Introduction

Context

Agriculture in Rwanda suffers from land degradation caused by poor farming practices and high levels of soil erosion (Maniriho et al., 2022). Agroforestry is recognized to be one of the worthwhile strategies for landscape restoration (Muneza, 2022), but its adoption remains low in the eastern region compared to other regions of the country. The low adoption rate often results from inadequately planned interventions which do not incorporate farmers' preferences for agroforestry in their design.

Research questions

- Are farmers willing to participate in agroforestry?
- What are their preferences for agroforestry?
- Do farmer preferences vary across plot characteristics?

2. Data and Methods

- Study area: Eastern Province of Rwanda
- Data collection: Choice experiment (CE) survey on 406 plots from 248 random households (Oct.-Nov. 2021).
- Approach: Discrete CE - A Bayesian D-optimal design with 28 choice cards split into 7 blocks - 4 choice cards per plot, and 3 plots per household at maximum.
- Econometric models: Mixed logit (MXL) and Latent Class (LC) models

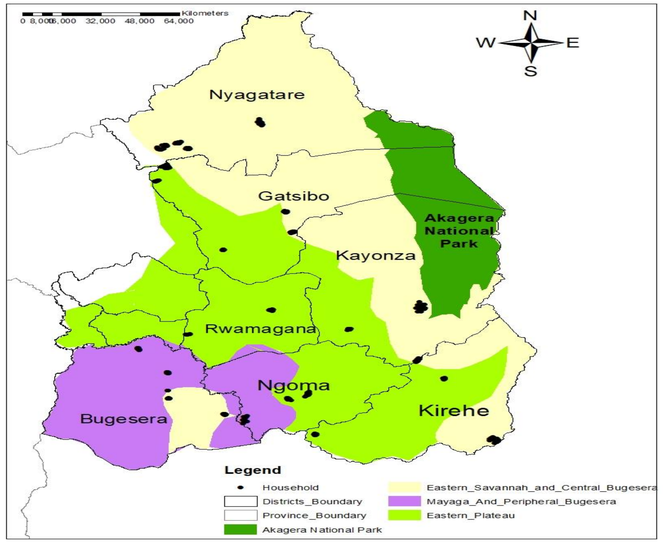

Figure 1: Map of the study area

3. Results

Table 1: Parameter estimates of the MXL and LC models

Attributes	MXL Model		LC Model	
	Coef.	Std. Dev	Class 1	Class 2
ASC (dummy coded)[1]	6.283***	3.012***	2.281***	3.822***
Non-fruit trees (number/are)	0.059**	0.078*	-0.049	0.283***
Fruit trees (number/are)	0.100***	0.175***	0.007	0.455***
Deep roots, small canopy[2]	0.475**	0.815	-0.079	2.177***
Deep roots, wide canopy[2]	-0.051	0.285	0.582***	-3.014***
Shallow roots, small canopy[2]	0.569*	0.035	0.711***	2.256***
Two extension visits per year[3]	0.307*	1.045**	-0.008	0.125
Extra labour (days/are)	0.003	0.212	0.160**	0.160
Distance to tree nursery (Km)	0.007	0.117**	0.015	-0.146***
Change in maize yield (Kg/are)	0.326***	0.212***	0.137***	0.350***
Cost per tree seedling (100 FRW)	-0.057***		0.0003	-0.232***
Log likelihood	-846.40		-867.49	
Class size (%Plots)			34.5	65.5
Obs.	4,872			

**** p<0.01, ** p<0.05, * p<0.1 ; [1]ASC takes 1 if agroforestry system is chosen, 0 if opt-out is chosen; [2]Shallow roots, wide canopy as base level, [3]One extension visit per year as base level*

- Positive preferences for non-fruit trees and especially fruit trees, trees with small canopy, trees with positive effect on maize yields, and two extension visits per year; but negative preference for cost of seedling (Table1).
- Change in maize yield, cost of tree seedlings, fruit trees and rooting system and canopy are the most important attributes in explaining farmer choices (Fig. 1).
- On 34.5% of the plots, increasing maize yields is more important than planting more trees (Class 1); on 65.5% of them (Class 2), planting (fruit) trees is preferred, but the cost of tree seedlings is prohibitive (Fig. 1).
- Home-plot distance is a major characteristic that distinguishes the two plot classes in terms of tree planting, with higher fruit tree density on plots that are near homes (Table2).

4. Conclusion

All farmers are interested in adopting agroforestry, but there is heterogeneity in their preferences. On 34.5% of the plots, they prioritize increasing maize yields; while on 65.5%, there is high interest to plant trees (mostly fruit trees). Agroforestry adoption in hampered by high cost of tree seedlings.

Figure 2: Relative importance of attributes

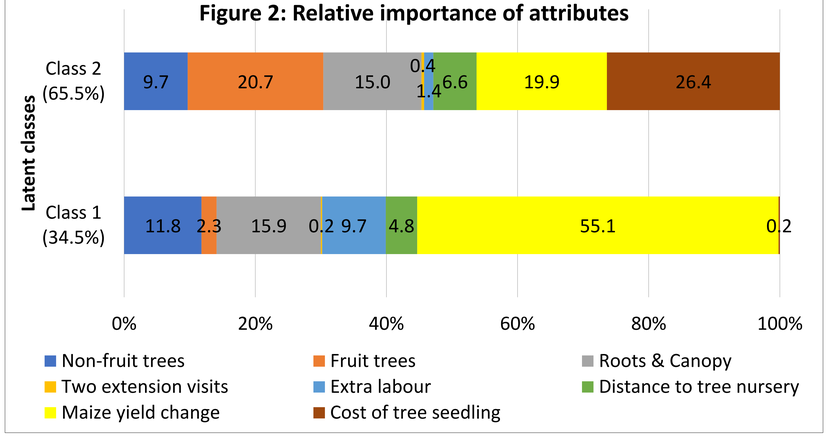

Table 2: Plot characteristics by latent class

Characteristics	Full sample	Class 1	Class 2	Chi2/t-test
Number of plots	406	140	266	
Plot location (% in Eastern Plateau)	41.4	45.0	39.5	
Size of arable land (ha)	0.28	0.27	0.28	
Distance from home to plot (Km)	0.92	1.19	0.78	**
Existence of at least 1 (% Yes)				
Non-fruit tree	69.5	63.6	72.6	*
Fruit tree	58.4	52.9	61.3	
Non-fruit/ fruit tree	85.7	82.9	87.2	
Tree density (trees/ha)				
Non-fruit trees	35.2	42.5	31.3	*
Fruit trees	20.5	14.9	23.4	***
Non-fruit & fruit trees	47.3	50.1	45.8	
Maize proportion on plots (>**75%**)	24.4	28.6	22.2	

References

- Maniriho, A., Musabanganji, E., Nkikabahizi, F., & Lebailly, P. (2022). Analysis of small-scale farmers' exposure to environmental risks: empirical evidence from rural Rwanda. *Agron. Afr.*, *34*(2), 281–291.
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