Diversity and use of trees for food security in smallholder farming systems of Uganda

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Introduction

- Trees on farms play a critical role in contributing to biodiversity conservation, energy and food security.

- Tree species diversity may sustain agricultural production and result into different livelihood options for smallholder farmers.

- However, there continues to be a decline in on-farm tree cover in most parts of Uganda.

- Engaging smallholder farmers, who constitute 80% of the farming population, to integrate trees on their farms is a strategic option.

- This study assessed tree species diversity on smallholder farms and its implication to food security and other livelihoods options.

Methodology

- The study was conducted in the eastern highlands of Uganda (Fig.1).

- Quantitative data were collected through a cross-sectional survey of 277 households selected through simple random sampling.

- A tree inventory form was used to record the number of trees and tree species established.

- Quantitative data were analyzed using STATA software version 13.0.

- Hierarchical cluster analysis to define smallholder farmer typologies

- An independent sample t-test was used to determine magnitude of the differences between smallholder farmer typologies.
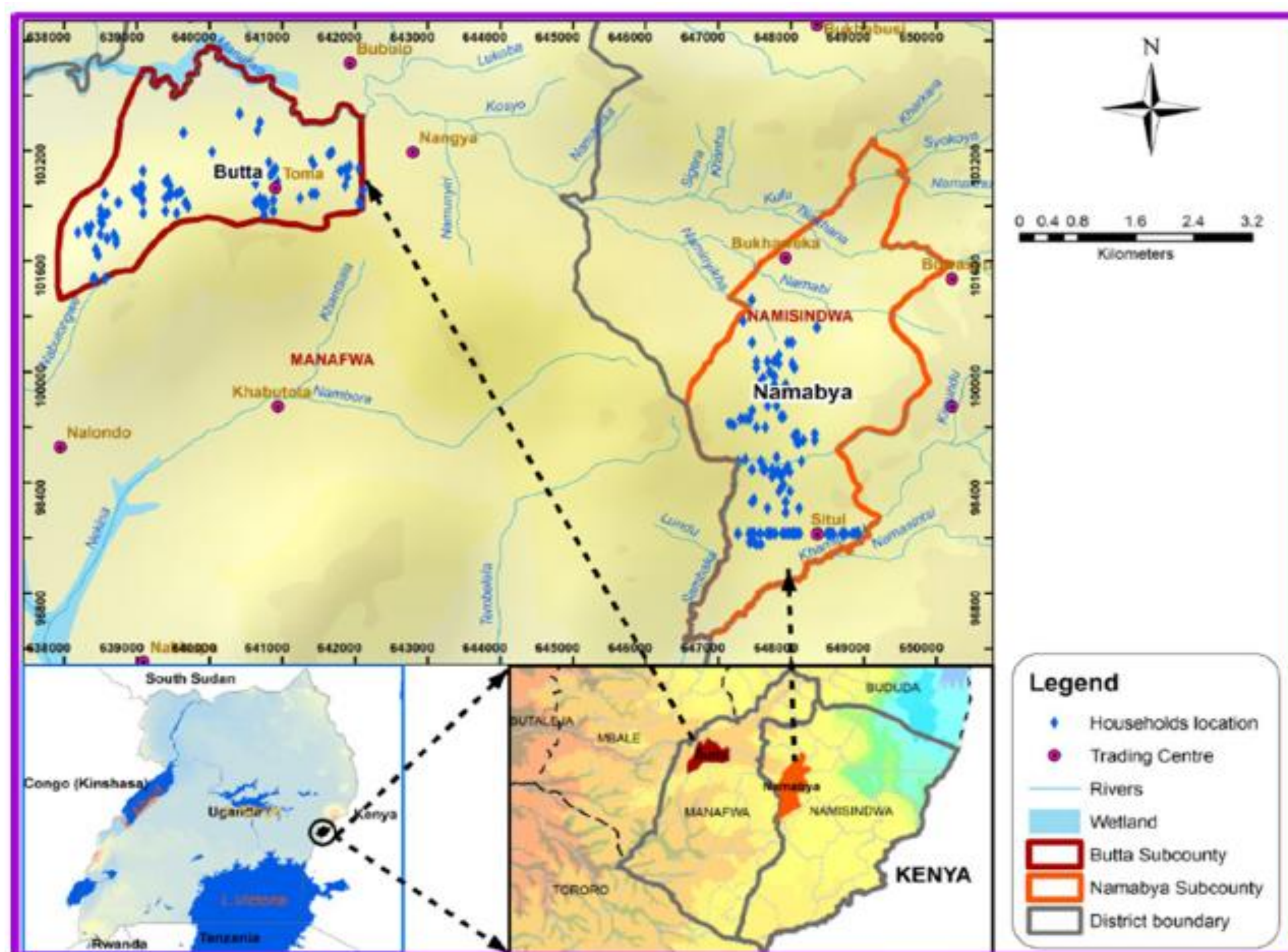

Fig. 1: Map showing study sites and sample distribution

Conclusion

- Smallholder farming households differ and any efforts to disseminate agroforestry technologies should consider designing specific interventions between the two typologies.

- Tree species diversity was higher in the subsistence than pre-commercial smallholder farms.

- We find evidence that tree species diversity is a key driver of food security especially among subsistence smallholders.

- Further studies should explore to understand the trade-off occurring between farm-level tree density and diversity and food security to establish a threshold.

Results

- Two smallholder farmer typologies were distinguished: subsistence and pre-commercial farmers

Table 1: Tree density and diversity between the two smallholder farmer typologies

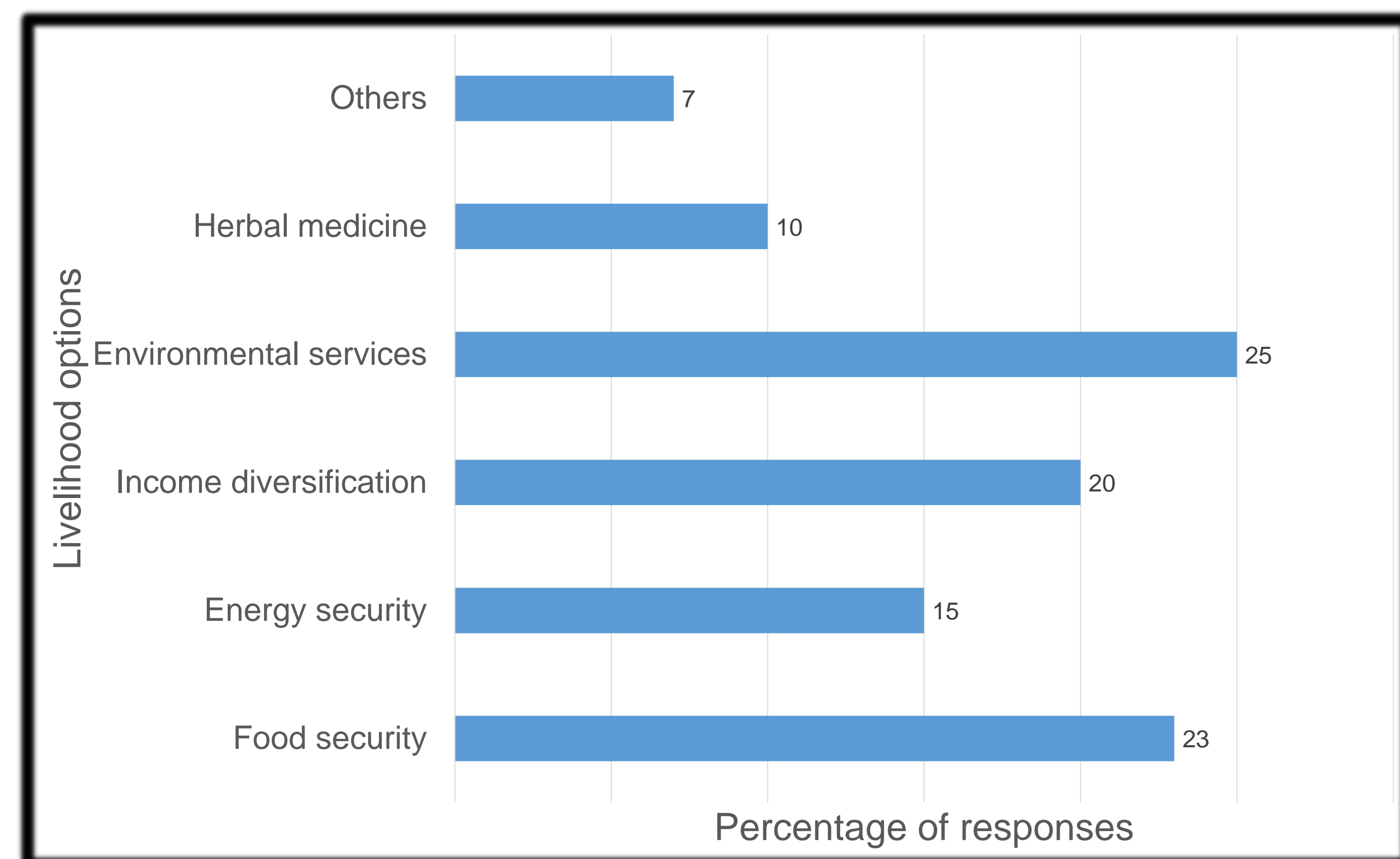| Smallholder farmer typology	No. of households	Av. No. of trees per ha	Species richness	Shannon diversity index
Subsistence	188	26 (+_14)	33	2.41*
Pre-commercial	89	111 (+_13)	19	1.62
Total	277	46 (+-27)	42	2.97

Fig. 2: Linkage between trees on farm and livelihood options

Table 2: Proportion of farmers integrating different tree species

| Tree Species	Main Uses	Subsistence	Pre-commercial
Cordia africana Lam.	Shade, soil fertility, medicine	74.3	15.0
Albizzia coriaria Welw.	Shade, soil fertility, medicine	81.3	17.8
Mangifera indica L	Food, medicine	65.8	7.8
Persea americana Mill.	Food, medicine	66.3	16.7
Carica papaya	Food, medicine	54.1	31.0
Neolamarckia cadamba Roxb	Timber, sticks, firewood	36.9	60.4
Calliandra calothyrsus	Firewood, soil fertility, fodder, fencing	37.0	55.2
Grevillea robusta A.Cunn. ex R.Br.	Timber, fuelwood	35.3	57.2
Eucalyptus spp.	Timber, poles, firewood	10.9	85.4
Markhamia lutea K.schum	Poles, medicine, timber	12.3	33.1
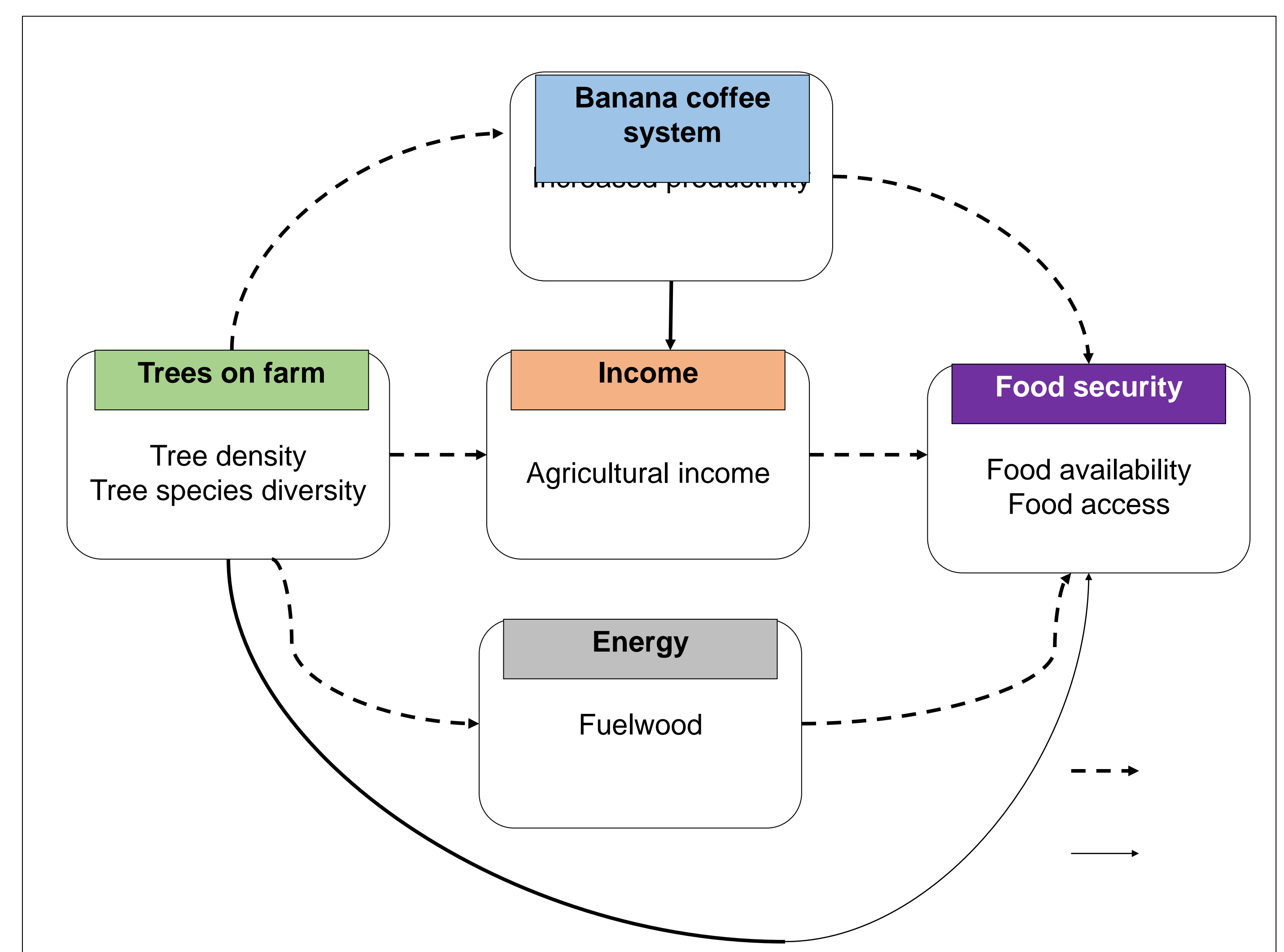
Fig. 3: Illustrating the relationship between tree species diversity and food security