High diversity agroforestry model for coffee in Nicaragua

1. Introduction & Goals

Agroforestry systems (AF) can support to cope with climate change (CC) challenges by reducing air temperature through shading [1] and slowing down wind speed [2], but also offer i.a. timber and fruits [3]. On the other hand, these systems are more knowledge-intensive [4] and coffee yield is usually lower, which sometimes can be compensated with byproducts from shade species [5]. The goals were to understand the readiness of Arabica coffee producers in Jinotega, Nicaragua for CC challenges by (I) assessing diversity, composition and density of coffee shade species in AF systems and (II) analyzing the information flow addressing producers about climate change and extreme weather events. (III) And also to find shade species which are beneficial for coffee.

2. Methods

- Face-to-face interviews in 2017 with 309 producers
- Questions referred to agricultural year May 2016 – April 2017
- Structured questionnaire, closed questions
- Data relies on producer's memory and statements

3. Results & Discussion

Almost all coffee plots (92%) shaded and 27% had a diverse AF system (>5 shade species/plot, fig. 1). Banana was clearly the most common shade species (fig. 2 & 3). Plots with a high shade density might be over-shaded and might negatively affect coffee yield (table 1). Producers considered guaba (*Inga* ssp.) the most beneficial shade species for coffee (table 2).

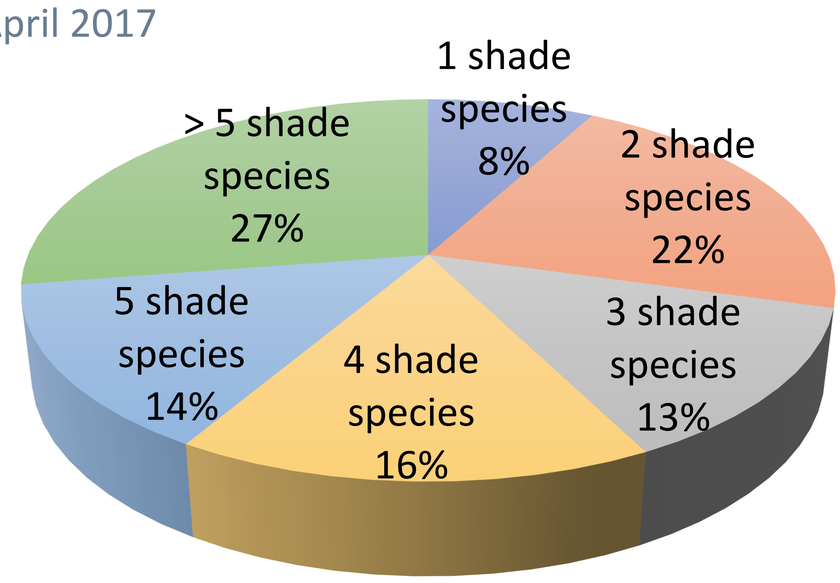

Fig 1: Distribution of number of shade species on coffee plots

Fig 2: Typical banana-coffee AF system

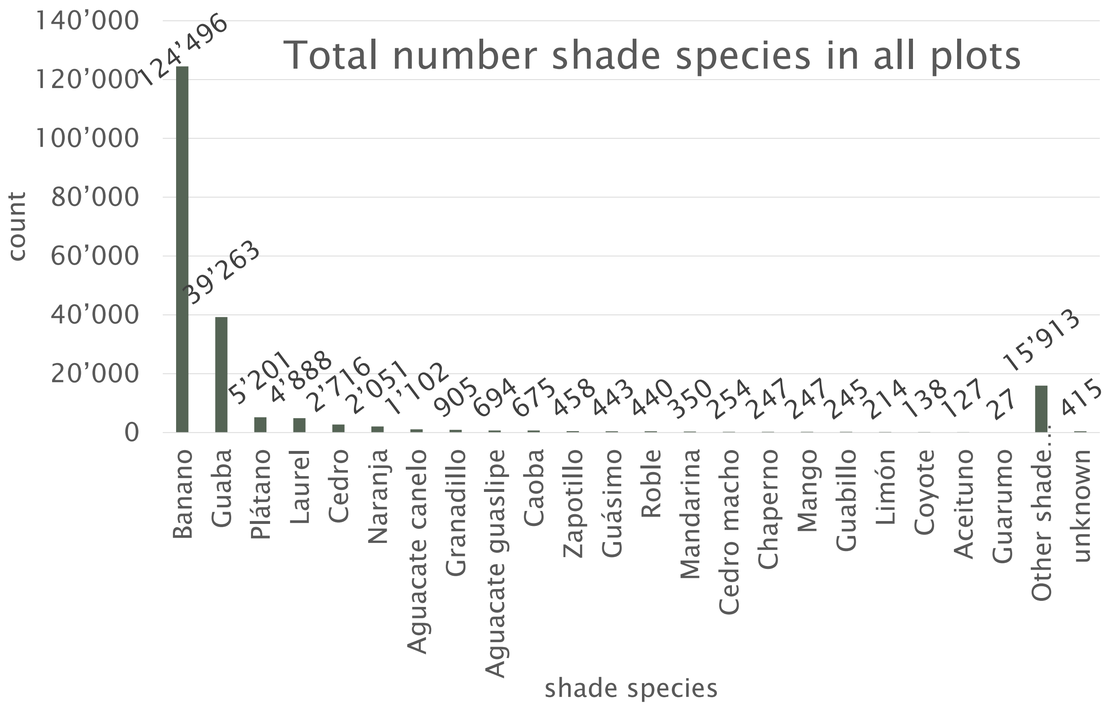

Fig. 3: Shade species dominated by banana (*Musa* spp.) and guaba (*Inga* ssp.).

Table 1: Average number of shade trees per ha in all coffee plots.

	Mean	Median	SD	1st Quantile	3rd Quantile	Min	Max	N
Total shade (trees/ha)	254	171	351	80	306	0.00	4'302	649

Table 2: Most common shade species and producers opinion on their effect on coffee.

Most common shade species	Shade species which are… (%)		
	considered beneficial for coffee	timber tree species associates well with coffee	timber tree species improving profitability of coffee
Guaba (*Inga* ssp.) (leguminous)	59.6	29.8	24.6
Banana (*Musa*) (fruit)	13.6	-	-
Cedro (*Cedrela odorata*) (timber)	3.2	22.0	17.2
Laurel (*Cordia alliodora*) (timber)	1.9	6.2	5.8
Caoba (*Swietenia macrophylla*) (timber)	0.3	5.8	6.8

4. Conclusions

- Banana most popular shade species (staple food, low trade-offs)
- Around half of the plots seem overshaded, recommended density ~70–156 trees/ha
- Although guaba (*Inga* sp.) and cedro (*Cedrela odorata*) considered beneficial by producers, no significant correlation between different predominant shade species and coffee yield found.

5. Recommendations

- Intensify extension service on shade tree management and commercialization to achieve high quality timber and fruits and high revenue.
- Simplify bureaucratic procedure for logging permit for AF systems to take pressure from forests.
- Include AF systems in the national forestry law to foster legal and sustainable logging.
- Improve information flow on climatic events addressing producers.
- Extend extension service on climate change adaptation measures and coffee best practices.

References

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