Scaling complex agroforestry: constrained by labour demand?

JP Steinfeld, M Almeida-Furtado, J Specht, MV Ramos Ballester, LO Ramos Filho, AC Rocha, Maridelia Rios Gonzaga, R Junqueira, D Amador, MF Guerreiro, GF Gonçalves, Elenito Hemes Lopes, RE Creamer, FJJA Bianchi, RPO Schulte

jonas.steinfeld@wur.nl

CONTEXT

More complex agricultural systems such as agroforestry can increase much needed soil-based ecosystem services, but it is often postulated that agroforestry requires higher labour demand. As farmers are experiencing increasing labour shortages, it is important to assess whether agroforestry complexity indeed increases labour demand.

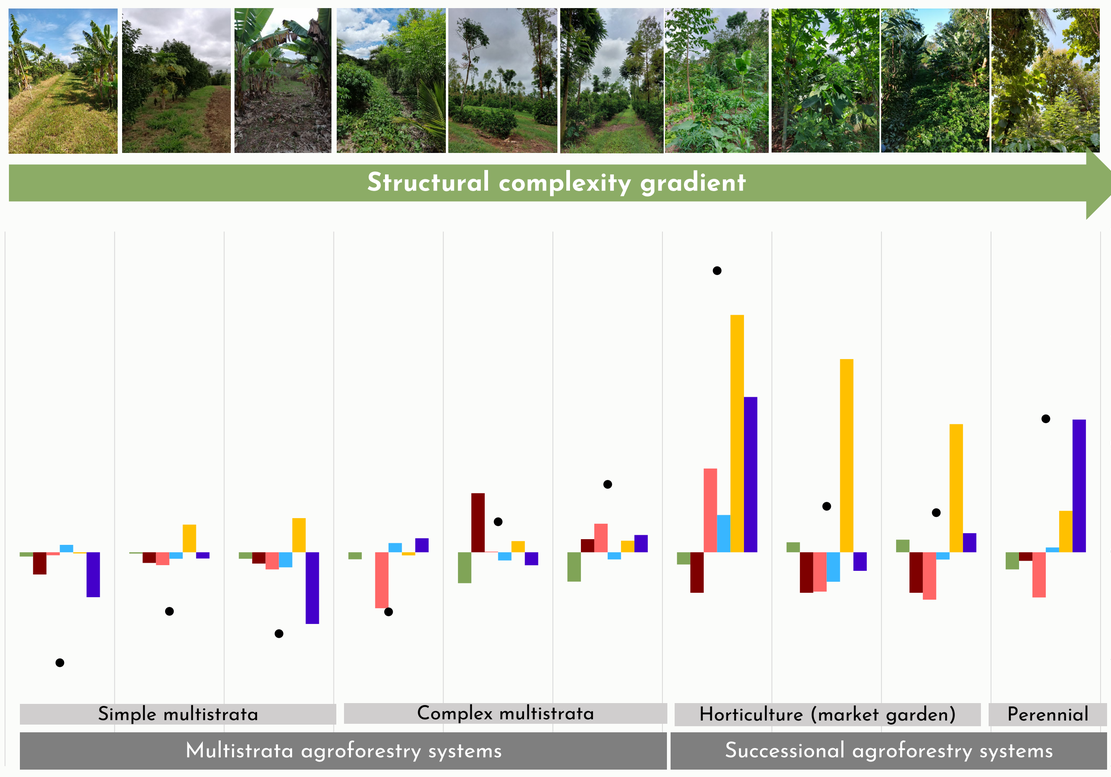
OBJECTIVE

1) Assess the relationships between agroforestry complexity, labour demand and soil-based ecosystem services
2) Assess the implications, as perceived by farmers themselves, for scaling agroforestry systems.

METHODS

- 10 case-study systems that represent a complexity gradient in south-eastern Brazil (*see also Steinfeld et al., 2023*)
- Quantified labour inputs for fertilization, weeding, pest control, crop management, biomass management and harvesting.
- Compared labour inputs to reference monocultures
- Surveyed farmers on challenges regarding the scaling of their agroforestry systems.

RESULTS



	Challenge	AFS10	AFS13	AFS14	AFS1	AFS7	AFS8	AFS9	AFS28	AFS5	AFS30
National	Compete with conventional products in the market	5	5	5	4	3	3	4	5	5	5
	Access to land	1	3	3	2	2	2	5	5	5	5
	Access to financial subsidies	4	4	4	5	2	2	5	5	5	5
Region	Access to extension/advisory service	2	2	2	5	1	1	5	3	4	3
	Labour availability at critical moments	4	3	3	3	5	5	5	2	5	4.5
	Find qualified and motivated labour	5	4	4	4	4	4	5	3	5	4
Farm	Machinery suited for dense agroforestry	1	1	2	2	1	1	4	2	4	5
	Diversity of tasks	2	2	2	2	2	3	5	5	4	2
	Knowledge about species' response to management	1	1	1	2	3	2	2	2	2	5
Field	Pruning at height	3	2	1	3	4	4	4	2	3	5
	Efficiently process pruning and mowing residues	1	1	1	3	4	4	5	4	2	3
	Weeding without removing mulch cover	2	2	2	1	5	5	3	2	3	2

- **Successional agroforestry systems required higher labour inputs than multistrata agroforestry systems** ($p<0.05$), and **also had significantly higher levels of soil-based ecosystem service indicators** (Available Water Capacity ($p<0.05$), CEC ($p<0.05$), P ($p<0.01$) and SOC ($p<0.05$)).
- **All successional agroforestry systems required higher labour inputs than monocultural references**, whereas **four out of six multistrata systems required less labour than monocultures.**
- **In successional systems**, substantially **more time was invested on *in situ* biomass management** and **less time was spent on pest control and weeding** than in monocultural systems.
- Farmers **of more complex successional agroforestry perceived challenges at field and farm scale**, such as access to adapted machinery and pruning at height, as **more difficult** than less complex multistrata agroforestry farmers.
- **Both groups of farmers perceived challenges at regional to national scale as particularly severe**, such as access to subsidies and competing with conventional products in the market.

CONCLUSIONS

Highest ecosystem service provision from successional agroforestry **associated with highest labour demand**, but intermediate **multistrata agroforestry can be less labour demanding than monocultures**.

Creation of job opportunities positive in the context of rural development, **but farmers cited the lack of suitable labour as a main constraint** to scaling agroforestry.

Study underscores the **need for enabling technological, financial and knowledge environments** to facilitate larger-scale transitions to agroforestry.

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