

Integrating Homemade Botanicals and Companion Cropping Improves Soil Fertility and Vegetable Productivity under Tropical Conditions

Introduction

- Smallholder vegetable production systems in sub-Saharan Africa is constrained by soil degradation and pest pressure
- Synthetic inputs degrades soil biodiversity and ecological functions
- Homemade botanicals and coriander companion cropping could provide nature-based alternatives
- **Research question:** Can the integration of homemade botanicals and coriander companion cropping improve soil fertility and productivity in a cabbage-garden pea rotational system?



Fig. 1: Botanical Extract Ingredients Before Preparation



Fig. 2: Farmer Demonstration of Botanical Pesticide Preparation



Fig. 3: Preparation of the Homemade Botanical Extract

Materials and Methods

- 6-year field experiment in Central Kenya, from 2020-2025
- RCBD with 4 treatment replicates: Sole crop, Sole crop + Botanicals, Intercrop (coriander), and Intercrop + Botanicals
- Data collected: Soil total N, organic C and available P; cabbage head diameter and marketable yield; garden pea plant height and grain yield
- Tools/methods: Soil auger and lab analysis; tape and digital scale
- Data analysis: Linear mixed models

Results and Discussion

- Intercrop + Botanicals recorded the strongest soil response, with high total N and organic C and highest available P by 2024 (Fig. 3)
- Cabbage productivity was highest under Intercrop + Botanicals (157.6 mm head diameter; 42.8 Mg ha⁻¹ marketable yield) (Fig. 4a,b)
- Garden pea also performed best under the combined treatment (68.2 cm height; 2.11 Mg ha⁻¹ grain yield) (Fig. 4c,d)

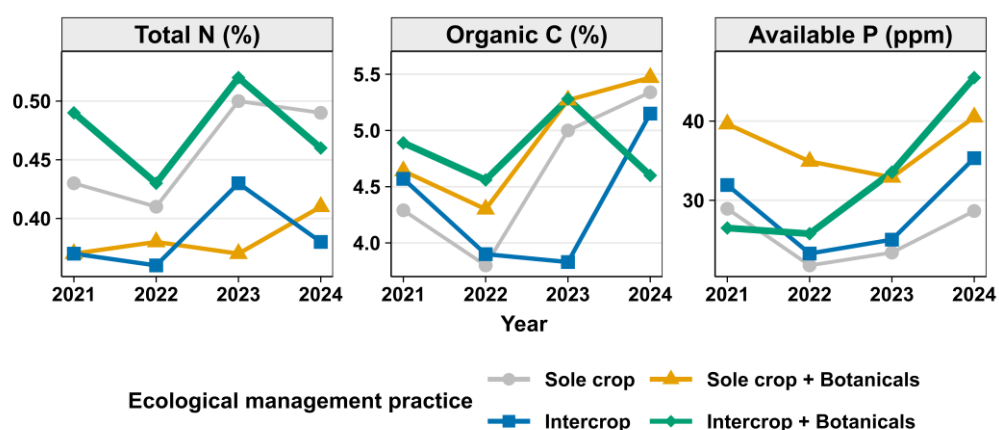


Fig. 4: Year-specific variation in soil property responses.

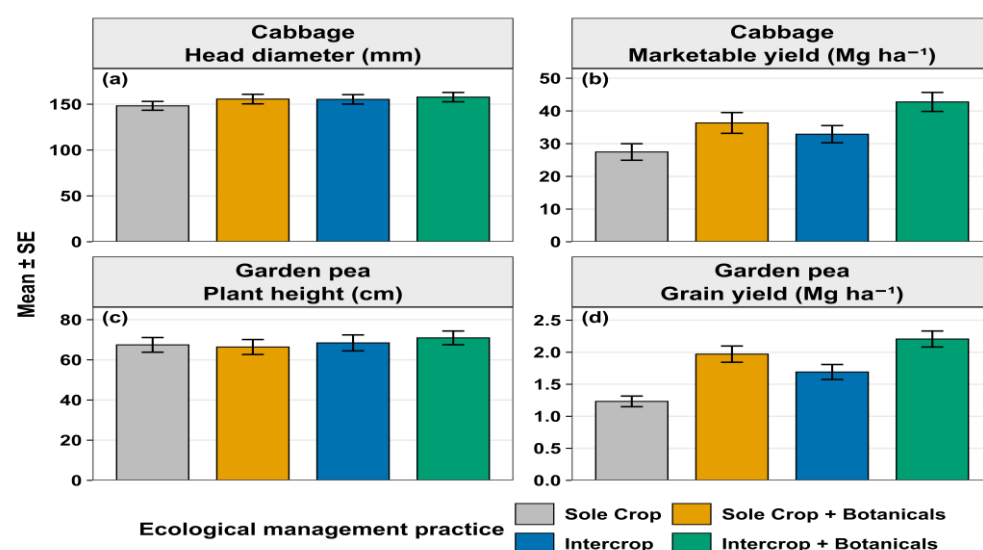


Fig. 5: Mean cabbage and garden pea performance

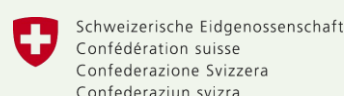
Conclusion

- Integrating coriander companion cropping with homemade botanicals improved soil fertility and crop productivity, providing a practical nature-based strategy for tropical smallholder vegetable systems

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