Agroecology in Action: Climate Change Mitigation and Plant Diversity Conservation in Tropical Homegardens

Subhrajit Saha1, P. K. Ramachandran Nair2, Vimala D. Nair3
1Department of Biology, Georgia Southern University, Statesboro, GA 30458, USA, 2School of Forest Resources and Conservation, and 3Soil and Water Science Department, University of Florida, Gainesville, FL 32611, USA

Introduction

- **Climate Change Mitigation and Biodiversity Conservation**: Two major environmental challenges
- **Homegarden (HG) Agroforestry System**: Indigenous agroecosystem with multistory combinations of trees and crops, sometimes with domestic animals; which follows the principles of agroecology and sustains millions of rural people in the tropics (Gliessman, 1990).
- **Study Objectives**: To, 1) measure the plant biodiversity of HGs, 2) measure and compare the HG SOC stocking with other land-use systems, and 3) understand the relationship between plant diversity and SOC sequestration.

Methodology

- **Location**: Thrissur, Kerala, India (Inceptisol) (Fig. 1)
- **Five Land-use**: Forest, rubber and coconut plantation, rice-paddy and HGs (Fig. 2, 3, and 4).
- **Four Depths**: 0–20, 20–50, 50–80, 80–100 cm.
- **HG Soc**: Large (>0.4ha) and Small (<0.4 ha).
- **Soc Measurement**: FLASH EA1112NC elemental analyzer.
- **Measurement of plant-stand characteristics** (Table 1).
- **Lower case letters** indicate differences at 0.05 probability level.

Results

- **Total number of economic plant species in Kerala HGs**: 106
- **Small HGs**: Higher mean species density and tree density (Table 1).
- ** Higher tree density**: Higher SOC (Fig. 5).
- **Higher Margalef Index**: Higher SOC.
- **Total SOC Stocking**: Forest > Small HG > Rubber > Large HG > Coconut > Rice-paddy (Fig. 7).

Discussion

- **Forest-like structure and composition of HGs** enable them to have high biodiversity and SOC comparable to forests.
- **High species assemblage in HGs results better resources-utilization** (Tilman et al., 1997) and greater NPP (Vandermeer, 1989), which may contribute to higher SOC sequestration.

Conclusions

- **The principles of agroecology**: Predominant in tropical homegardens.
- **The plant species assemblage in HGs**: Biodiversity conservation.
- **Food crops in HGs**: Food security.
- **HG SOC stocking**: High climate change mitigation potential.
- **Agroecological significance**: Plant biodiversity and climate change mitigation, a mutually beneficial relationship.

References

