

Agroforestry as a nature-based solution for water-scarce drylands: Ecological and economic outcomes from a Melia Dubia-based system in Karnataka, India

Sai Kumar C. Bharamappanavara¹, Ajay Kumar Mishra², Manmeet Kaur³, and Pavan Kumar Yeggina⁴

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Background:

- Agroforestry with fast-growing multipurpose trees is widely promoted as a nature-based strategy for restoring degraded tropical soils.

Problem Statement:

- Quantitative evidence linking Melia dubia plantations to integrated soil health indices remains limited.
- Socio-economic challenges such as financial burden on farmers because of increased cost of cultivation and reduced profits etc. Hence Crop Diversity and Agro forestry based cultivation feasibility is the need of the hour.
- Farm is owned by Suitcase (Remotely operating the farm) farmer, hence want to check the feasibility of growing Agro-forestry enterprise does make the Agri enterprise profitable.

Study Objective:

Assess whether the Agro-forestry system with Melia Dubia is economically viable and ecologically beneficial under rainfed, water-scarce dryland conditions Across – i) Soil Health & Biodiversity; (ii) Income Generation, (iii) Climate Resilience, and (iv) Sustainable Livelihoods.

Study Location & Major Strategies Adopted:

- Monitored plot is a linear Melia Dubia boundary planting of approximately 1.5 ha, located at approximately 14.2626° N, 75.5799° E in the Davanagere, Shimoga district of Karnataka, India.
- Grown 1250 Melia Dubia plants in 2.5 Acrea [1 hectare]
- Compared a 10-year-old M. Dubia-based agroforestry system with an adjacent treeless control on a Red Oxisol, sampling three depths (0–5, 5–15, and 15–30 cm) at an initial and a final stage of a monitored interval (n = 3).
- Assessed the Cost and Returns of the Tradition field crop cultivation against Agro-forestry based Cultivation.
- Agroforestry plantation was established in June 2015 and clear-felled at harvest in April 2026, giving an 11-year satellite record spanning roughly one full pre-planting baseline year through post-harvest.

Method and Sources of Data:

- Bio-physical assessment of Soil Parameters.
- Satellite-based earth observation record of canopy development.
- Economic Assessment of Cost & Returns of Meli-Dubia based Agro forestry with convetional practices (Maize and field crops).

All Observations are taken for Control-Initial, Control-Final, M. dubia-Initial, and M. dubia-Final.

Major Agro-Forestry Systems Followed in India

- Agri-silvicultural Systems:** System combines trees with crops in a single land area
- Silvo-pastoral Systems:** Involves the combination of trees and the grazing of domesticated animals on the same land
- Agro-silvi-pastoral Systems:** More complex system that integrates all three components: trees, crops, and animals.



State wise Scale and intensity of Agroforestry in India

