

PROJECT INFORMATION

Evaluation of Cashew-Based Agroforestry Systems on Sloping Lands of the West Coast Region of India

PROJECT OVERVIEW

Funding Agency	Institute /ICAR
Total Outlay	85.55 lakhs
Duration	August 2024 – July 2029
Single / Multi-Institutional	Single
Principal Investigator	Dr. Uthappa A R
Co-Investigators	Dr. Sujeet Desai, Dr. Gopal Mahajan, Dr. Bommayasamy

RATIONALE

The West Coast region of India has extensive sloping lands vulnerable to soil erosion, nutrient loss and declining productivity. Cashew-based agroforestry offers an opportunity to combine a high-value cash crop with complementary crops and trees to conserve soil, improve resource-use efficiency, enhance biodiversity and diversify farmer income. However, scientific information on tree–crop interactions and optimal system combinations under these conditions remains limited. This project will therefore develop and evaluate suitable cashew-based agroforestry models for sloping lands, generating evidence-based recommendations for improving productivity, profitability, climate resilience and ecological sustainability in the West Coast region.

RESEARCH GAPS

- Despite the potential of cashew-based agroforestry on sloping lands, critical gaps remain in understanding tree–crop interactions, intercrop suitability and soil–water conservation. Key research gaps include:
 - Tree–crop interactions: Limited information on competition and complementarity for light, water and nutrients, including root distribution, nutrient-use patterns and microclimate modification under cashew-based systems.
 - Intercrop performance: Insufficient evidence on suitable intercrops, productivity, compatibility and economic returns under different cashew plantation conditions.

- Soil and water conservation: Limited quantitative assessment of runoff, soil loss, nutrient loss and water retention under different cashew-based agroforestry configurations on sloping lands.
- System optimization: Lack of validated tree–crop combinations, spatial arrangements and management practices that simultaneously enhance productivity, profitability and resource-use efficiency.
- Climate resilience: Inadequate understanding of how cashew-based agroforestry systems can improve farm resilience to intense rainfall, soil degradation and climatic variability.

OBJECTIVES

1. To evaluate tree-crop interactions and performance of intercrops under cashew-based agroforestry systems.
2. To estimate runoff and soil losses under different cashew-based agroforestry systems.

ACTIVITIES

1. Establishment and Evaluation of Cashew-Based Agroforestry Systems
 - Design, layout and establishment of experimental cashew-based agroforestry systems with suitable intercrops.
 - Monitoring of cashew growth, intercrop growth and yield, and tree–crop interactions.
 - Assessment of resource-use efficiency, including light, soil moisture and nutrient interactions, where applicable.
 - Compilation, statistical analysis and interpretation of experimental data.
 - Documentation of findings and preparation of technical reports and recommendations.
2. Soil and Water Conservation Assessment
 - Design and implementation of appropriate soil and water conservation measures under different agroforestry configurations.
 - Installation and calibration of multi-slot runoff plots/devices for measurement of runoff, soil and nutrient losses.
 - Periodic monitoring and recording of runoff, soil loss and sediment characteristics under different treatments.
 - Collection and analysis of soil samples for physical, chemical and fertility parameters.
 - Evaluation of the effectiveness of agroforestry configurations in reducing runoff and soil erosion and improving soil quality.
 - Statistical analysis, interpretation, compilation of results and preparation of technical reports.

EXPERIMENTAL DETAILS

Treatment:	T1	Cashew only
	T2	Cashew + Grazing Guinea
	T3	Cashew + DGG-1

	T4 Cashew + BN Hybrid (CO-5) T5 Grazing Guinea only T6 DGG-1 only T7 BN Hybrid (CO-5) only T8 Bare Area (Control)
Fertilizer Doses	Recommended dosage of fertilizers
Variety	Cashew- Goa Cashew 5; Fodder Grasses: Grazing guinea, DGG-1, BN Hybrid (CO-5)
Replications:	3.0
Observations:	A. Growth and Productivity Assessment Tree Parameters • Tree height • Collar diameter • Canopy spread Crop Parameters • Growth attributes • Biomass production • Yield performance B. Tree-Crop Interaction Studies • Light interception and availability • Soil physico-chemical properties • Resource-use interactions C. Economic Evaluation • Cost of cultivation • Gross returns • Net returns • Benefit-cost ratio • Runoff and Soil Loss Assessment Multislot divisors will be installed in each treatment plot for quantification of runoff and soil losses.
GPS Coordinates:	15.492041, 73.921461

EXPECTED OUTPUT

- Identification of the most productive cashew-based agroforestry system for sloping lands of west coast region of India
- Quantification of run-off and soil loss under different cashew-based agroforestry system

EXPECTED OUTCOME

- Improved farmer income and livelihood security through productive cashew-based agroforestry systems.
- Enhanced soil and water conservation for sustainable and climate-resilient farming on sloping lands.
-

FIELD INFORMATION

When the field was developed:	August 2024
What are crops being cultivated season-wise:	Cashew and Fodder Crops
Soil type:	Predominantly lateritic, gravelly clay loam to clay loam; classified as Typic Ustorthents (USDA).
Soil pH, EC, OC:	pH: 5.5; EC: 0.10–0.14 dS m ⁻¹ ; Soil organic carbon (SOC): 0.79–1.10%.
Soil depth:	0–0.90 m
Soil NPK and Micronutrient status:	Available N: 44–107 kg ha ⁻¹ (low); P: 10–13 kg ha ⁻¹ (low to medium); K: 128–226 kg ha ⁻¹ (medium)
Common pests and diseases:	Tea mosquito bug (TMB) & Cashew stem and root borer (CSRB)