

PROJECT INFORMATION

Evaluation of fast- growing tree species and bamboo germplasm in the lateritic soils of the west coast region of India

PROJECT OVERVIEW

Funding Agency	Institute /ICAR
Total Outlay	28.24 lakhs
Duration	4 years (2024-2028)
Single / Multi-Institutional	Single
Principal Investigator	Dr. Uthappa A.R.
Co-Investigators	Dr. Gopal Mahajan, Dr. Nivya K R

RATIONALE

The lateritic soils of the West Coast region require site-specific tree and bamboo species that can establish, grow rapidly and provide multiple ecosystem and economic benefits. However, comparative information on the growth, productivity, wood properties, soil improvement and carbon-sequestration potential of fast-growing tree species and bamboo germplasm under these conditions is limited. The project will therefore evaluate selected tree species and diverse bamboo germplasm for adaptability, biomass production, soil health and carbon storage, while identifying promising species/genotypes for agroforestry, afforestation, sustainable wood production and climate-resilient land management in the West Coast region of India.

RESEARCH GAPS

- Despite the potential of fast-growing trees and bamboo for sustainable land management, site-specific evidence for the lateritic soils and agroecological conditions of the West Coast region remains limited. The major research gaps are:
 - Species and germplasm adaptability: Limited comparative information on the growth, survival, productivity and adaptability of fast-growing tree species and bamboo germplasm under West Coast conditions.
 - Soil health impacts: Insufficient understanding of how different tree species and bamboo influence soil fertility, nutrient cycling, soil organic carbon and other soil properties in lateritic soils.

- Biomass and carbon sequestration: Limited long-term data on above- and below-ground biomass production and soil carbon storage of these species under local conditions.
- Wood and biomass quality: Inadequate information on wood properties, biomass productivity and potential end uses of promising fast-growing species.
- Bamboo germplasm evaluation: Lack of systematic evaluation and conservation of economically important bamboo germplasm for growth, productivity, site suitability and potential utilization in the West Coast region.
- Economic and resource sustainability: Limited evidence on the economic potential, resource-use efficiency and suitability for agroforestry/afforestation of promising tree species and bamboo. The present project addresses these gaps through comparative evaluation of fast-growing tree species and bamboo germplasm, linking growth and productivity with soil improvement, biomass and carbon storage to identify suitable species and germplasm for sustainable land-use systems in the West Coast region.

OBJECTIVES

1. To assess the performance, growth and wood properties of various tree species.
2. To investigate the impact of tree species on soil properties.
3. To quantify the biomass and soil carbon stock associated with different tree species.
4. To collect, conserve and evaluate bamboo germplasm for growth, productivity and suitability under the agroecological conditions of the West Coast region of India.

ACTIVITIES

Objective 1. To assess the performance, growth and wood properties of various tree species

Activities:

1. Designing, layout and establishment of the fast-growing tree species experiment.
2. Periodic recording of survival, growth and biometric parameters of different tree species.
3. Assessment of wood properties of selected tree species.
4. Compilation, statistical analysis and interpretation of data.
5. Preparation of technical report and recommendations.

Objective 2. To investigate the impact of tree species on soil properties

Activities:

1. Collection of soil samples from experimental plots at different depths and intervals.
2. Analysis of physical, chemical and soil fertility parameters.
3. Assessment of changes in soil properties under different tree species.
4. Compilation, statistical analysis and interpretation of data.
5. Preparation of technical report.

Objective 3. To quantify the biomass and soil carbon stock associated with different tree species

Activities:

1. Estimation of above-ground and below-ground biomass using non-destructive and destructive methods.
2. Estimation of tree biomass carbon stock and soil organic carbon stock.
3. Assessment of species-wise carbon sequestration potential.
4. Compilation, statistical analysis and interpretation of data.
5. Preparation of technical report and recommendations.

Objective 4. To collect, conserve and evaluate bamboo germplasm for growth, productivity and suitability under the agroecological conditions of the West Coast region of India

Activities:

1. Collection, identification and documentation of economically important bamboo germplasm.
2. Establishment and maintenance of a bamboo germplasm conservation and evaluation block.
3. Recording of survival, growth, clump characteristics, culm production and productivity.
4. Evaluation of germplasm for adaptability and site suitability under West Coast conditions.
5. Identification of promising bamboo germplasm for agroforestry, plantation and value-added applications.
6. Compilation, statistical analysis, interpretation and reporting of results.

EXPERIMENTAL DETAILS

Treatment:	T1 Casuarina (Seedling) T2 Casuarina Clone CH-5 T3 Casuarina Clone OV-15 T4 Casuarina Clone ITC-1761 T5 Eucalyptus Clone ITC-1803 T6 Subabul (Leucaena leucocephala) T7 Melia dubia (K-10) T8 Corymbia Hybrid
Fertilizer Doses	Recommended dosage of fertilizers
Variety	Casuarina (Seedling), Casuarina Clone CH-5, Casuarina Clone OV-15, Casuarina Clone ITC-1761, Eucalyptus Clone ITC-1803, Subabul (Leucaena leucocephala), Melia dubia (K-10), Corymbia Hybrid
Replications:	4.0

Observations:

- A. Growth and Productivity Assessment Tree Parameters
 - Tree height
 - Collar diameter
 - Diameter at breast height (DBH)
 - Survival percentage Productivity Assessment
 - Biomass production
 - Wood yield
 - Economic returns
- B. Wood Property Analysis The harvested wood samples will be evaluated for:
 - Basic wood density
 - Fibre characteristics
 - Pulping suitability
 - Industrial wood quality parameters
- C. Soil Property Assessment Changes in soil quality will be assessed through analysis of:
 - Soil physical properties
 - Soil chemical properties
 - Soil biological properties
- D. Biomass and Carbon Assessment
 - Above-ground biomass estimation using non-destructive methods.
 - Validation through destructive sampling.
 - Biomass carbon estimation.
 - Soil carbon stock estimation.

Bamboo observations in

1. Survival (%)
2. Number of culms per clump
3. Number of new culms per year
4. Culm height (m)
5. Culm diameter (cm)
6. Internodal length (cm)
7. Clump diameter (m)
8. Culm weight (kg)
9. Pest and disease incidence
10. Overall growth performance

GPS Coordinates:

15.486560, 73.919803

EXPECTED OUTPUT

- Identification of suitable fast-growing tree species and clones for the lateritic soils of the West Coast region.
- Generation of scientific data on wood properties, biomass productivity, and carbon sequestration potential of commercially important tree species.
- Identification and characterization of promising bamboo germplasm for growth, productivity, and adaptability to the lateritic soils and agroecological conditions of the West Coast region.

EXPECTED OUTCOME

- Improved farmer income and livelihood diversification through adoption of high-performing tree species and bamboo germplasm for wood, biomass and value-added industries.
- Enhanced climate resilience and carbon sequestration through increased biomass production, soil carbon storage and wider adoption of suitable tree and bamboo-based land-use systems.

FIELD INFORMATION

When the field was developed:	July 2024
What are crops being cultivated season-wise:	No season wise crops. Only fast growing tree species/clones are grown
Soil type:	Lateritic and gravelly clay loam
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:	0–0.60m
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:	No major pest and diseases reported yet