ICAR-CENTRAL AGROFORESTRY RESEARCH INSTITUTE, Jhansi

To conduct basic, strategic and applied research on agroforestry National Research Centre for Agroforestry (NRCAF) was established in the year 1988 at Jhansi. As approved in the XIIth Plan w.e.f. 1st December 2014 NRCAF has been upgraded as ICAR-Central Agroforestry Research Institute (ICAR-CAFRI). Agroforestry has the potential to achieve sustainability in agriculture, while optimizing its productivity and mitigating climate change impact. The Institute has strengthened its research activities and significant achievements of agroforestry research undertaken through the in house and external funded projects, network and inter-institutional collaboration, technology demonstrations and capacity building has paved the way for its recognition and upgradation.

MISSION: To improve quality of life of rural people through integration of perennials on agriculture landscape for economic, environmental and social benefits.

VISION: Integration of woody perennials in the farming system to improve land productivity through conservation of soils, nutrients and biodiversity to augment natural resource conservation, restoration of ecological balance, alleviation of poverty and to mitigate risks of weather vagaries.

MANDATE

- Develop sustainable agroforestry practices for farms, marginal land and wastelands in different agro-climatic zones of India.
- Coordinate network research for identifying agroforestry technologies for inter-region.
- Training in agroforestry research for ecosystem analysis.
- Transfer of agroforestry technology in various agro climatic zones.

INFRASTRUCTURE

Total Area: 114,932 ha. (Research Farm Area-83.864 ha; Rocky, Unutilizable, Ponds Area-24.532 ha; Roads-5.44 ha and Office Premises-1.096 ha).

ISO 9001:2015: ICAR-CAFRI has been accredited ISO 9001-2015 certificate for its management standards.

**Library**: The library has 4549 books including Hindi books and subscribes 15 Indian Journals.

**Other Facilities**: Agroforestry Technology Information Centre (ATIC), Canteen, Agriculture Knowledge Management Unit, Photography Unit, Conference Hall, Committee Hall, Training Hall, Shed House, Mist Chamber etc.

**AICRP on Agroforestry**: AICRPAF was initiated in 1983. A new Centre at ICFGTB (ICFRE) Coimbatore was approved in 2012. The total centers are now 37 Centers (11 in ICAR Institutes, 01 in ICFRE and 25 in SAUs), covering all the major agro-ecological zones of the country.

![Organizational Setup](image)
Research Programme

System Research

Integration of agricultural crops/grasses and/or animal with woody perennial simultaneously or sequentially in a unit of farm land is known as agroforestry. Agrisilviculture and agrihorticulture are most popular and accepted systems out of four major systems, which are grouped based on their structure as agrisilviculture, agrihorticulture, silvipasture and agrisilvipasture. The system provides various farm needs like food, fodder, fuelwood, timber etc. There are several forms in which trees are planted in agriculture lands with arable crops. For examples; intercropping with woody perennials, bund plantation, hedgerow/alley intercropping, scattered tree, tree planted as windbreaks/shelterbelts and home garden/homestead.

Institute has been working on various aspects of agroforestry like tree-crop interaction, soil fertility improvement, system productivity in terms of food grain, fuel wood, fodder and timber etc., pest and disease interaction, tree management, agrotechnique, growth behavior of trees under rainfed and irrigated ecosystem, evaluation of crops for shade tolerance, development of soil quality index, assessment of biomass and carbon stock and economics of the systems. During first five years of its establishment, the main focus of research was on system productivity with various multipurpose trees and crops, compatibility of tree crop combinations, density optimization of trees, root management for minimizing belowground competition, Nutrient dynamics and pest & disease interaction.

Institute identified and developed prominent agroforestry systems for irrigated as well as rainfed conditions for different agroclimatic region. The systems envisage important multi-purpose tree species (MPTS) such as Poplar (*Populus deltoides*), Eucalyptus (*Eucalyptus treticornis*), Neem (*Azadirecta indica*), Shisham (*Dalbergia siso*), Teak (*Tectona grandis*), Bamboos (*Bambusa spp.*), Karanj (*Pongamia pinnata*), Jatropha (*Jatropha curcas*), Siris (*Albizia procera*), Anjan (*Hardwickia binata*) and Ailanthus. A number of crops (cereals, grasses, legumes, oil seeds) and medicinal & aromatic plants have been evaluated as intercrops under different agroforestry systems. Number of fruit trees and their varieties have been introduced in different agroforestry systems.
Natural Resource & Environment Management

Under basic & strategic research, effect of microclimate change and shade level, ecophysiology and regeneration studies were conducted at the institute. In order to assess the contribution of agroforestry in soil conservation, a soil quality index (SQI) for assessing soil health of different agroforestry systems is being developed.

The institute is working on assessment of carbon sequestration potential of agroforestry systems existing on farmer’s field in different agro-climatic regions through simulation model (CO2Fix model), mapping of agroforestry area using GIS and Remote Sensing (RS) techniques and thermo tolerance studies. Methodology for mapping area under agroforestry system have been developed and standardized. Mapping of agroforestry area in 12 agro-climatic zones has been completed and the area under agroforestry was estimated to be 23.25 million ha of total geographical area of these zones (267.66 million ha).

ICAR-CAFRI initiated three agroforestry based watershed development projects in the Bundelkhand region. These are located at Garhkundar-Dabar in Niwari district of M. P. (2005), Domagor-Pahuj at Babina Block (2008) and Parasai-Sindh (2011) both in Jhansi district of U. P. The experiences so far indicate that adoption of the technology can not only arrest runoff, soil & nutrient losses besides resolving drinking water crisis but also increase irrigation facilities by at least 1/3rd. Agroforestry development can enhance biomass production by 3 folds besides drought proofing. The base flow and ground water recharge could be increased by least three and two times, respectively, ensuring surface wateravailability in water courses for 8 months as against 3 months in a year.
Tree Improvement, Post-Harvest & Value Addition

Tree Breeding and Improvement work concentrated on Neem (*Azadirachta indica* A. Juss), Shisham (*Dalbergia sissoo* Roxb.), Kardhai (*Anogeissus pendula*), Babul (*Acacia nilotica*) and Biofuel species (*Jatropha curcas* and *Pongamia pinata*) with the following objectives, *viz.*

- Exploration, collection, evaluation, characterization, multiplication and conservation of germplasm
- Studies on genetic variability present in nature
- Study mode of pollination/reproductive biology
- Standardization of vegetative propagation techniques; Identification of elite types and Establishment of seed orchards of elite types

Institute collected large number of germplasm of important agroforestry species from various parts of the country. It includes 220 accessions of Neem, 32 of Shisham, 63 of Babul, 16 of Kardhai, 138 of Karanj and 284 of Jatropha. In Jatropha oil content ranged from 22.79 - 40.31 per cent on seed basis, and in Karanj between 30.28 to 39.43 per cent. Institute has registered accessions of different agroforestry species with NBPI. It includes Neem (178), Shisham (36), *Acacia nilotica* (24), Jatropha (152) and Karaj (40).

Institute conducted work on Jatropha and Karanj under promotion of biofuels. Institute identified suitable trees for gum and resin in different agro-climatic regions for development of agroforestry.

To promote livelihood opportunities for the farmers, introduced lac based agroforestry system for the semi-arid Bundelkhand region on palas and ber trees which are very common in this region. Success of lac cultivation in katki crop (rainy season) was observed in the region. The preliminary results indicate good possibility to promote lac cultivation in the
region.

D. HRD, Technology Transfer & Refinement

Institute is giving due emphasis on Human Resource Development by organizing summer / winter schools; training programmes (agriclinic & agribusiness, cultivation of Jatropha & Karanj, natural resource management and agroforestry development under IWMP scheme), short courses, capsule courses, Kisan Gosthis, Kisan Melas, training to rural women and youth, farmers training camps, training to resource personnel, etc. Institute organized Women Farmers’ Day on 15th October, 2018.

ICAR-CAFRI, Jhansi organized more than hundred three days’ training on (a) Livelihood Security through Agroforestry and organic farming and (b) Natural Resource Management and development of watershed through agroforestry for farmers and field functionaries of Bundelkhand region under Pradhan Mantri Krishi Sinchai Yojna-Watershed Development, State Level Nodal Agency, Govt. of U.P., Lucknow.

International Trainings

- International Trainings/Workshops- An International Training Program entitled, "Research Methods in Agroforestry" was organized during 1st -5th December, 2014 at Jhansi by ICAR- Central Agroforestry Research Institute (ICAR-CAFRI) jointly with South Asia Programme of International Centre for Research on Agroforestry (ICRAF), New Delhi.

- Institute Organized SAARC Workshop on “Technological Advancement in Agroforestry Systems: Strategy for Climate Smart Agriculture Technologies in SAARC Countries” during 16th -18th June, 2015 at ICAR-CAFRI, Jhansi.

- Trust for Advancement of Agricultural Sciences, Indian Council of Agricultural Research, World Agroforestry Centre, Indian Society of Agroforestry, Asia-Pacific Association of Agricultural Research Institutions and National Academy of Agricultural Sciences organized the Regional Consultation from 8th -10th October, 2015 at National Agricultural Science Complex, ICAR, New Delhi to develop future Road Map for enhanced adoption of agroforestry systems.

- SAARC Regional Training on “Smart Practices for Climate Resilient Agriculture” was jointly organized by ICAR-CAFRI, Jhansi; NRM Division, ICAR, New Delhi; SAARC Agriculture Centre, Dhaka; SAARC Forestry Centre, Thimpu and
The International Food Policy Research Institute, South Asia Office, New Delhi during 16th to 20th November, 2015 at NAAS, National Agricultural Science Complex, ICAR, New Delhi.

- An International Training on “Ecosystem Services in Agroforestry: Concept, Theory and Practice” was jointly organized by ICAR-CAFRI with ICRAF, New Delhi under ICAR-ICRAF Collaborative Work Plan from 6th - 9th December, 2016 at Jhansi. The participants included Scientists and Technical officers from the ICAR-CAFRI, ICAR-IGFRI, Jhansi; Regional Centre of IISWC, Datia; AICRPAF Centre and NGO.

- International Training on “Ecosystem Services in Agroforestry in the context of Payment of Ecosystem Services: Concept, Theory and Practice” was jointly organized by ICAR-CAFRI with ICRAF, New Delhi under ICAR-ICRAF Collaborative Work Plan from 20th - 24th November, 2017 at Jhansi. The participants were Scientists from AICRPAF Centers, ICRAF and ICAR-CAFRI, Jhansi.

Technologies Developed by the Institutes
- Eucalyptus based Agrisilviculture System
- Superior Genotype of Neem (Azadirachta indica)
- Aonla based Agroforestry Land Use For Rainfed Condition in Bundelkhand Region
- Bundel-2 (PT-2) and Bundel-6 (PT-6) varieties of D. sissoo developed
- Design of Low Cost Checkdam Using Gabion in Bundelkhand Region
- Rainwater Harvesting and Recycling on Watershed Basis for Bundelkhand Region
- Cost Effective Design of Rainwater Harvesting Structures (RWHS)
- Prevention of Seepage through Rainwater Harvesting Structures
- Bench grafting in Aonla (Emblica officinalis Gaertn.)
- Vegetative Propagation of Neem Through Air Layering
- Vegetative Propagation of Pongamia pinnata through Stem Cuttings and Air Layering
- Top Working of Carissa (wild karonda)
- Bench Grafting in Ber (Zizyphus spp.)
- Methodology for Early Selection of Elite Trees of Acacia nilotica
- Concept of Drought Proofing in Bundelkhand Region
- Methodology for mapping agroforestry area using GIS & Remote Sensing