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Annual Report 2024

All India Coordinated Research Project on Agroforestry

ICAR-Central Agroforestry Research Institute

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Preface

Agroforestry stands out as an excellent approach for diversifying agricultural enterprises and integrating them to achieve higher returns while minimizing risks associated with climate variability. It is practiced by millions of farmers worldwide and has been an integral part of life and livelihoods in India for centuries. However, with the advent of modern technologies, agroforestry has evolved to play a pivotal role in land use optimization, farm income diversification, and natural resource management. It holds the potential to drive the economic transformation of farmers significantly.

Recent studies by ICAR-Central Agroforestry Research Institute, Jhansi, indicate that approximately 28.427 million hectares in 15 agro-climatic zones of India are under agroforestry. Initially, agroforestry research and development focused on basic and strategic studies, showcasing its benefits and encouraging its systematic integration into traditional farming systems. Today, with the introduction of the National Agroforestry Policy and the implementation of the Sub-Mission on Agroforestry, there is a pressing need to incorporate industrial perspectives and quantify the environmental benefits of agroforestry. This would enable policymakers to take decisive actions and foster collective efforts for the widespread adoption and advancement of agroforestry practices. The All India Coordinated Research Project initiated by ICAR in 1983 has contributed tremendously to providing tree-based land use options. The coordinating centres are conducting recurrent surveys to design new technologies based on the requirements of the stakeholders and evaluating different tree species and their germplasm for higher productivity and adaptability. This annual report summarizes the salient achievements of the coordinating centre and detailed results of each centre.

The guidance received from Dr. Himanshu Pathak, Secretary, DARE and DG, ICAR is gratefully acknowledged. The mentorship role of Dr. S.K. Chaudhari, Deputy Director General (NRM), Dr. Rajbir Singh, Assistant Director General (Agronomy, Agroforestry and Climate Change) and suggestions helped in implementing the project activities. I am grateful to all the Vice-Chancellors and Directors of Research of SAU's and Directors of ICAR institutes, for participating in this project. Thanks are due to OIC's (Agroforestry) at all coordinating centres for their efforts in executing the project at their respective centres.

I record my thanks to all the Scientific, Technical and Administrative staff of CAFRI, Jhansi for their help in the working of this project. My special thanks are due to the scientists of the Project Coordinating unit of the Project for their sincere efforts and help in the execution of the project and preparation of this report.

(A. ..Arunachalam)
Director, ICAR-CAFRI &
Project Coordinator, AICRP-Agroforestry

प्रस्तावना

कृषिवानिकी, कृषि उद्यमों में विविधता लाने और जलवायु परिवर्तनशीलता से जुड़े जोखिमों को कम करते हुए उच्च रिटर्न प्राप्त करने के लिए उन्हें एकीकृत करने के लिए एक उत्कृष्ट दृष्टिकोण के रूप में सामने आता है। यह दुनिया भर में लाखों किसानों द्वारा किया जाता है और सदियों से भारत में जीवन और आजीविका का एक अभिन्न अंग रहा है। हालांकि, आधुनिक प्रौद्योगिकियों के आगमन के साथ, कृषिवानिकी भूमि उपयोग अनुकूलन, कृषि आय विविधीकरण और प्राकृतिक संसाधन प्रबंधन में महत्वपूर्ण भूमिका निभाने के लिए विकसित हुई है। यह किसानों के आर्थिक परिवर्तन को महत्वपूर्ण रूप से संचालित करने की क्षमता रखता है।

आईसीएआर–केन्द्रीय कृषिवानिकी अनुसंधान संस्थान, झाँसी के हालिया अध्ययनों से संकेत मिलता है कि भारत के 15 कृषि–जलवायु क्षेत्रों में लगभग 28.42 मिलियन हेक्टेयर कृषिवानिकी के अंतर्गत है। प्रारंभ में, कृषिवानिकी अनुसंधान और विकास बुनियादी और रणनीतिक अध्ययनों पर केंद्रित था। आज, राष्ट्रीय कृषिवानिकी नीति की शुरुआत और कृषिवानिकी पर उप–मिशन के कार्यान्वयन के साथ, औद्योगिक दृष्टिकोण को शामिल करने और कृषिवानिकी के पर्यावरणीय लाभों को मापने की तत्काल आवश्यकता है। यह नीति निर्माताओं को निर्णायक कार्रवाई करने और कृषिवानिकी प्रथाओं को व्यापक रूप से अपनाने और उन्नति के लिए सामूहिक प्रयासों को बढ़ावा देने में सक्षम करेगा। आईसीएआर द्वारा 1983 में शुरू की गई अखिल भारतीय समन्वित अनुसंधान परियोजना ने वृक्ष–आधारित भूमि उपयोग विकल्प प्रदान करने में काफी योगदान दिया है। समन्वय केंद्र हितधारकों की आवश्यकताओं के आधार पर नई तकनीकों को डिजाइन करने और उच्च उत्पादकता और अनुकूलनशीलता के लिए विभिन्न वृक्ष प्रजातियों और उनके जर्मप्लाज्म का मूल्यांकन करने के लिए आवर्ती सर्वेक्षण कर रहे हैं। यह वार्षिक रिपोर्ट समन्वय केन्द्र की प्रमुख उपलब्धियों और प्रत्येक केन्द्र के विस्तृत परिणामों का सारांश प्रस्तुत करती है। डॉ. हिमांशु पाठक, सचिव, कृषि अनुसंधान और शिक्षा विभाग और महानिदेशक, आईसीएआर से प्राप्त मार्गदर्शन के लिए मैं कृतज्ञतापूर्वक आभार व्यक्त करता हूं। डॉ. एस.के. चौधरी, उप महानिदेशक (एनआरएम), डॉ. राजबीर सिंह, सहायक महानिदेशक (कृषि विज्ञान, कृषिवानिकी और जलवायु परिवर्तन) की सलाहकार भूमिका और सुझावों ने परियोजना गतिविधियों को लागू करने में मदद की। मैं, इस परियोजना में भाग लेने के लिए एसएयू के सभी कुलपतियों और अनुसंधान निदेशकों और आईसीएआर संस्थानों के निदेशकों का आभारी हूँ। सभी समन्वय केन्द्रों के ओआईसी (कृषिवानिकी) को उनके संबंधित केंद्रों पर परियोजना को क्रियान्वित करने के प्रयासों के लिए धन्यवाद देना चाहिए। मैं इस परियोजना के कामकाज में मदद के लिए केन्द्रीय कृषिवानिकी अनुसंधान संस्थान, झाँसी के सभी वैज्ञानिक, तकनीकी और प्रशासनिक कर्मचारियों के प्रति अपना आभार व्यक्त करता हूँ।

(ए. अरुणाचलम)
निदेशक, भाकृअनुप–केकृवाअनुसं एवं
परियोजना समन्वयक, एआईसीआरपी–कृषिवानिकी

Contents

1. कार्यकारी सारांश/Executive Summary

कृषि उद्यमों में विविधता लाने और विभिन्न कृषि गतिविधियों को एकीकृत करने, बेहतर रिटर्न सुरक्षित करने और जलवायु परिवर्तनशीलता से जुड़े जोखिमों को कम करने में मदद करने के लिए कृषिवानिकी को सर्वोत्तम प्रथाओं में से एक माना जाता है। कृषिवानिकी पर अखिल भारतीय समन्वित अनुसंधान परियोजना एशिया–प्रशांत क्षेत्र में एक अनूठी नेटवर्क पहल के रूप में सामने आई है, जो वृक्ष–आधारित भूमि उपयोग रणनीतियों के विकास में महत्वपूर्ण योगदान दे रही है। 37 समन्वय केन्द्रों (एसएयू में 26, आईसीएआर में 10 और आईसीएफआरई में 1) के साथ, परियोजना हितधारकों की जरूरतों के आधार पर नई प्रौद्योगिकियों को डिजाइन करने के लिए नियमित सर्वेक्षण करती है और बढ़ी हुई उत्पादकता और अनुकूलनशीलता के लिए विभिन्न वृक्ष प्रजातियों और उनके जर्मप्लाज्म का मूल्यांकन करती है। परियोजना के लक्ष्यों को प्राप्त करने के अलावा, ये केन्द्र सक्रिय रूप से सीमा वृक्षारोपण जागरूकता अभियान (हर मेड़ पर पेड़) और जनजातीय उप योजना (टीएसपी) और अनुसूचित जाति उप योजना (एससीएसपी) को लक्षित करने वाले कार्यक्रमों में संलग्न हैं।

पिछले वर्ष, 17 केन्द्रों ने विभिन्न क्षेत्रों में अपनी निदान और डिजाइन गतिविधियाँ जारी रखीं। पूरे भारत में किए गए सर्वेक्षण विभिन्न प्रकार की कृषिवानिकी प्रथाओं को दर्शाते हैं। तमिलनाडु के मेट्टुपालयम तालुक में, किसान सागौन के बागान, मेड़ पर रोपण और करी पत्ते के साथ मेलिया की अंतरफसल लगाने में संलग्न हैं। महाराष्ट्र के दीवान खावती में, कृषिवानिकी प्रणालियों में होमस्टेड बागवानी, मेड़ वृक्षारोपण और सागौन, आम, नारियल और काजू से जुड़ी फसल–आधारित प्रणालियाँ शामिल हैं। झाड़ग्राम, पश्चिम बंगाल में, इंटरक्रॉपिंग, एली क्रॉपिंग और गमेलिना और डायसॉक्सिलम जैसी प्रजातियों के साथ सीमा पर रोपण जैसी प्रथाएं आम हैं। अगापाला, ओडिशा में, होमस्टेड एग्रोफोरेस्ट्री विंडब्रेक और मिट्टी की उर्वरता जैसे लाभों के लिए बारहमासी और वार्षिक दोनों पेड़ों को एकीकृत करती है।

वृक्ष सुधार के संबंध में, बांस सहित लगभग 40 वृक्ष प्रजातियों का परीक्षण चल रहा है, और परिणामों को विशिष्ट कृषि–जलवायु क्षेत्रों के लिए उपयुक्त क्लोन, किस्मों या चयनों को जारी करने के लिए संसाधित किया जा रहा है। सिस्टम अनुसंधान में, अधिकांश केन्द्र मौजूदा कृषि वानिकी मॉडल का मूल्यांकन करना जारी रख रहे हैं, जिसका उद्देश्य अनुशंसित प्रथाओं के लिए उपयुक्त फसल किस्मों की पहचान करना है। कुछ केंद्रों ने नए परीक्षण भी शुरू किए हैं, जैसे मेलिया–आधारित औषधीय कृषि वानिकी मॉडल और आम–आधारित कृषि–बागवानी प्रणाली। मौजूदा परीक्षणों से वर्ष 2023–24 के परिणाम कृषिवानिकी प्रणालियों की समग्र गणना और मूल्यांकन के लिए सारणीबद्ध हैं।

Agroforestry is considered one of the best practices for diversifying agricultural enterprises and integrating various agricultural activities, helping to secure better returns and mitigate risks associated with climate variability. The All India Coordinated Research Project on Agroforestry stands out as a unique network initiative in the Asia-Pacific region, making significant contributions to the development of tree-based land use strategies. With 37 coordinating centers (26 in SAUs, 10 in ICAR, and 1 in ICFRE), the project conducts regular surveys to design new technologies based on stakeholder needs and evaluates various tree species and their germplasm for enhanced productivity and adaptability. In addition to achieving the project's goals, these centers actively engage in boundary plantation awareness campaigns (Har Med Par Ped) and programs targeting Tribal Sub Plan (TSP) and Scheduled Caste Sub Plan (SCSP).

In the past year, 17 centres continued their diagnostic and design activities across different regions. Surveys conducted across India show a variety of agroforestry practices. In Mettupalayam Taluk, Tamil Nadu, farmers engage in teak plantations, bund planting, and intercropping Melia with curry leaf. In Divan Khavati, Maharashtra, agroforestry systems include homestead gardening, bund plantations, and crop-based systems involving teak, mango, coconut, and cashew. In Jhargram, West Bengal, practices such as intercropping, alley cropping, and boundary planting with species like Gmelina and Dysoxylum are common. In Agapala, Odisha, homestead agroforestry integrates both perennial and annual trees for benefits such as windbreaks and soil fertility.

Regarding tree improvement, around 40 tree species, including bamboo, are under trial, and the results are being processed to release clones, varieties, or selections suitable for specific agro-climatic zones. In system research, most centres are continuing to evaluate existing agroforestry models, with objectives such as identifying suitable crop varieties for recommended practices. Some centres have also introduced new trials, such as the Melia-based medicinal agroforestry model and the Mango-based agri-horticulture system. The results from these trials in 2023-2024 are being compiled for comprehensive evaluation of agroforestry systems.

नर्सरी में 425,000 से अधिक पौधे तैयार किए गए, जिन्हें विभिन्न केन्द्रों पर अन्य अंतःफसलों के साथ बेचा या वितरित किया गया। 2023–2024 में एआईसीआरपी–कृषिवानिकी केन्द्रों के माध्यम से कुल लगभग 8,000 किसानों को कृषि वानिकी प्रौद्योगिकियों से लाभ हुआ। इसके अतिरिक्त, केन्द्रों ने अभ्यासकर्ताओं को कृषि वानिकी और वृक्ष–केन्द्रित सलाह प्रदान की। 26 अप्रैल 2021 को, आईसीएआर–सेंट्रल एग्रोफोरेस्ट्री रिसर्च इंस्टीट्यूट, झाँसी और एआईसीआरपी–एग्रोफोरेस्ट्री ने खेत की मेड़ों और सीमाओं पर पेड़ उगाने में आने वाली चुनौतियों पर ध्यान केन्द्रित करते हुए 'हर मेड़ पर पेड़' पहल पर एक आभासी विचार–मंथन सत्र का आयोजन किया। इस वार्षिक रिपोर्ट में प्रकाशनों सहित आगे की गतिविधियों और वैज्ञानिक आउटपुट का विवरण दिया गया है।

Over 425,000 seedlings were produced in nurseries, which were sold or distributed, along with other intercrops at various centres. A total of approximately 8,000 farmers benefitted from agroforestry technologies through the AICRP-Agroforestry centres in 2023-2024. Additionally, the centres provided agroforestry and tree-centric advice to practitioners. On 26th April 2021, ICAR-Central Agroforestry Research Institute, Jhansi, and AICRP-Agroforestry organized a virtual brainstorming session on the 'Har Med Par Ped' initiative, focusing on challenges in growing trees along farm bunds and boundaries. Further activities and scientific outputs, including publications, are detailed in this annual report.

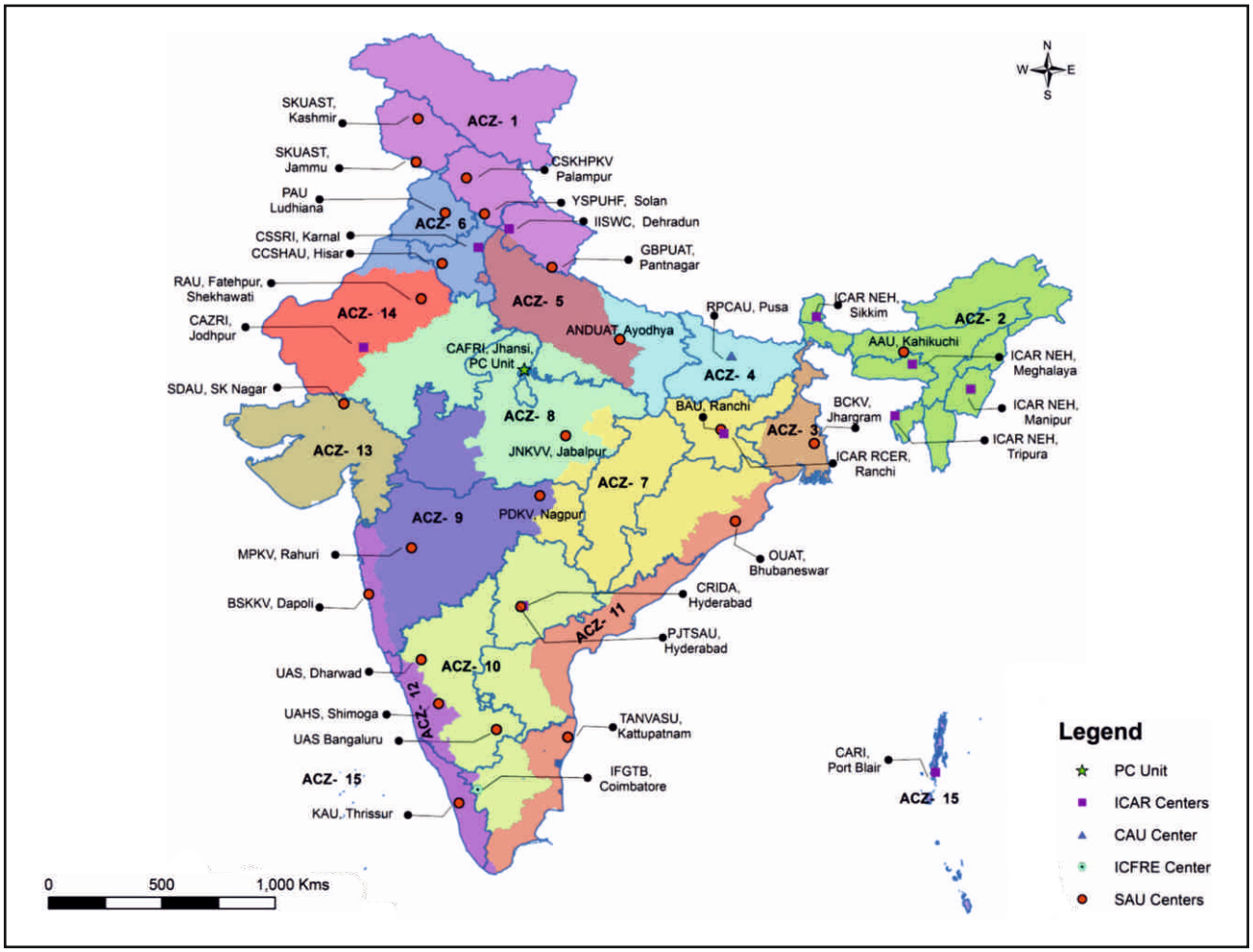
2. Introduction

The All India Coordinated Research Project (AICRP) on Agroforestry was started in 1983 with 20 centres and it has now expanded to 37 centres – 26 in SAUs, 10 in ICAR Institutes and 1 in ICFRE Institute representing all agro-climatic zones in the country (Figure 1). The Coordinating unit of AICRP-Agroforestry was shifted from ICAR Headquarters to CAFRI, Jhansi w.e.f. 1st April, 1997 with the following specific mandates:

- ✓ Screening and genetic upgrading of selected plant species for their compatibility in different agroforestry systems
- ✓ To optimize tree-intercrop combination for different regions
- ✓ Performance enhancement of the pre-dominant agroforestry systems being already practiced by the farmers
- ✓ To upgrade and refine the existing technologies for higher productivity and sustainability.

Objectives:

- Diagnostic survey and appraisal of existing farming system and agroforestry practices and farmers' preference.
- Collection and evaluation of promising tree species, cultivars of fuel, fodder and small timber for agroforestry interactions.
- Studies on management practices of agroforestry systems such as agri-silviculture, boundary plantation, silvipasture, silvi-horticulture, agri-silvi-horticulture, multistorey, homestead, *etc.*
- To analyze economics of agroforestry systems.
- To explore and attribute the role of agroforestry in environment protection.
- To conduct studies on post-harvest technology, fishery, apiculture, lac, *etc.* in relation to agroforestry systems.



ICAR-Central Agroforestry Research Institute (ICAR-CAFRI), formerly the National Research Centre for Agroforestry, is a multidisciplinary premier research institute of the Indian Council of Agricultural Research (ICAR) with a major focus on integrating trees, crops, and livestock on the same farmland. The Institute is in Jhansi, Uttar Pradesh (25.5° N 78.5° E), India and has a total area of 254.859 acre (214.079 research farm and 40.78 office & residential area). CAFRI is the only dedicated research institute of the country working on key research areas of agroforestry with 31 scientists, 16 technical, 12 administrative and 8 skilled supporting staff as its sanctioned cadre strength. CAFRI has developed robust agroforestry models and package of practices for different agroclimatic conditions covering small and marginal farmers and provides technical backstopping to the States and stakeholders.

3. Salient Achievements

SK UNIVERSITY OF AGRICULTURAL SCIENCE & TECHNOLOGY OF SRINAGAR, SRINAGAR

i) Diagnostic and Design

The survey conducted in Karnah Valley, Kupwara District, located at an altitude of 1202–3587 m near the Line of Control, highlights the diversity and prominence of agroforestry systems in the region. Four systems were identified: Home Gardens, Agri-Horticulture, Boundary Plantation, and Horti-Silviculture, with Home Gardens being the most prevalent, practiced by 98.25% of farmers, followed by Agri-Horticulture (77.90%) and Boundary Plantation (36.62%). Key tree species included *Salix alba* (Willow), *Populus nigra* (Black Poplar), and *Robinia pseudoacacia* (Black Locust), alongside fruit trees like *Citrus limon* (Lemon), *Citrus bergamia* (Orange), *Punica granatum* (Pomegranate), *Malus domestica* (Apple), and *Prunus avium* (Cherry). The crops grown varied with the season, including paddy, beans, maize, potatoes, and vegetables like spinach, tomato, and cabbage in *Kharif*, and peas, carrot, turnip, and radish in *Rabi*. Regional distinctions showed walnut cultivation dominating Tangdar Block and orange cultivation prominent in Teetwal Block. These agroforestry systems integrate fruit, timber, and crop components, supporting household needs, income generation, and soil conservation, thereby sustaining agricultural productivity and enhancing livelihoods in this challenging high-altitude region.

ii) Tree Germplasm Collection, Evaluation and Improvement

Survey, collection, multiplication, and evaluation of best clones of cricket bat willow (*Salix alba var. caerulea)* in Kashmir

In a survey and evaluation of 15 clones of *Salix* collected from Dr. Y.S. Parmar University, Solan, in February 2021, the clones were transplanted to a nursery and later to the field in 2024. However, due to a prolonged drought lasting three and a half months, only 50% of the transplanted clones survived. Among the clones, 35 (NZ-1179) showed superior performance, achieving a height of 3.50 m and a collar diameter (CD) of 19.32 mm. Additionally, in 2023, cuttings of two wicker willow species, *Salix triandra,* and *Salix dacymate*, were collected from two locations in Srinagar (Telbal and Batipora) for nursery evaluation. After two growing seasons, *Salix dacymate* outperformed with an average height of 80.10 cm and a collar diameter of 7.99 mm, followed by *Salix triandra*, which recorded 37.61 cm in height and 5.67 mm in collar diameter.

iii) System Research

Evaluation of Apricot based agroforestry system under temperate conditions of Kashmir

After the eleventh growing season, the apricot-based agroforestry system at Benhama demonstrated significant potential for stakeholders. Apricot trees achieved a

Nursery Evaluation of salix clones

maximum height of 5.0 m and collar diameter of 97.51 mm when intercropped with orchard grass, followed by 4.21 m and 94.64 mm, respectively, when combined with lucerne. The system also yielded an average fruit production of 7.12 kg tree^{-1}, with kernel processing revealing an oil content of 39.68%. Among the four fodder crops intercropped, orchard grass performed best, producing a green fodder yield of 22.82 t ha^{-1}, followed by tall fescue with a yield of 15.24 t ha^{-1}, showcasing the system's efficiency in integrating fruit and fodder production.

Evaluation of different grasses under apple orchards for developing a workable horti-pasture system under the mountain region of Kashmir valley (Orchard grass Var.- Comet, Tall fescue, red clover, Sainfoin.)

In an apple-based horti-pasture agroforestry system evaluated after the eleventh growing season, apple trees produced an average fruit yield of 7.0 kg tree^{-1} when intercropped with tall fescue, followed by 5.0 kg tree^{-1} with orchard grass under degraded land conditions. Among the fodder grasses and legumes intercropped in the system—orchard grass, tall fescue, red clover, sainfoin, and natural grass (control)—sainfoin showed the highest performance, yielding 16.1 t ha^{-1} of green fodder, followed by orchard grass with 10.04 t ha^{-1}. The reduction in fruit and fodder yields during this growing season was attributed to a prolonged drought.

Evaluation of walnut-based Agroforestry system under temperate conditions of Kashmir valley

In a walnut-based agroforestry system evaluated after the tenth growing season, the CITH-Walnut-1 genotype demonstrated superior performance, producing the highest weight of 26.0 g fruit^{-1}, followed by CITH-Walnut-3 with 18.80 g fruit^{-1}. The system also achieved the maximum fodder yield of 12.0 t ha^{-1} in T_1 (Walnut + Lucerne), followed by T_2 (Walnut + Orchard Grass) with 11.12 t ha^{-1}. Analysis of dried kernels revealed that among the five genotypes, CITH-3 exhibited the highest flavonoid and flavanol content (10.07 mg g^{-1} QE), followed by Sulaiman (8.82), CITH-1 (6.81), and Hamdan (5.92). At the same time, the lowest was recorded in CITH-2 (5.21).

Performance of Horti-Silvi-Medicinal and Horti-Silvi-Agriculture Systems under different apple tree densities under temperate conditions of Kashmir Valley

In the horti-silvi-medicinal agroforestry system established in autumn 2019, different apple varieties, including Red Velox and Gala Mast, were planted at varying densities and intercropped with lavender and local beans. After five growing seasons, a 98% survival rate was observed for fruit trees across all spacing treatments. Phytochemical analysis of lavender using the GC-MS technique identified 20 compounds, with the highest concentrations recorded for Eucalyptol (19.0%), Linalool (41.4%), Alpha-Terpineol (5.37%), and Linalyl Acetate (14.91%). Among the treatments, T_8 (1m x 1m spacing) yielded the highest fruit biomass at 3.3 t ha^{-1}, followed by T_7 with 2.23 t ha^{-1}.

SK UNIVERSITY OF AGRICULTURAL SCIENCE & TECHNOLOGY OF JAMMU, JAMMU

i) Diagnostic and Design

A diagnostic survey was conducted in the Kandi areas of Kathua District to identify the prevalent agroforestry systems. The study covered four subdivisions: Basholi, Billawar, Kathua, and Hiranagar. Data was collected using a

pre-structured interview schedule through personal interviews with household members. Information on agroforestry systems was gathered from the respondents, who were classified based on the nature of the components in the system. A total of 72 farmers were selected using multistage random sampling. The findings revealed that the average age of respondents was 43.97 years, with an average family size of 6.89. Land holdings were largest in Hiranagar and smallest in Basholi. A significant 77.78% of respondents reported agriculture as their primary occupation. The study identified two main agroforestry systems: the agri-silvi-horticultural system and the agro-silver-pastoral system. A total of 32 tree species, including fruit, fodder, fuelwood, and timber trees.

ii) Tree Germplasm Collection, Evaluation and Imporovement

Four collections of Harad (*Terminalia chebula*) from Jammu (J&K) and three locations in Himachal Pradesh (Paragpur, Kalar, and Palodi) are being maintained in the experimental farm of the Division. Data collected in 2023 for various growth parameters showed that the highest plant height

(4.95 m) and collar diameter (12.07 cm) were recorded in the Pragpur collection. In contrast, the Jammu selection exhibited the smallest plant height (3.34 m) and collar diameter (9.03 cm). Regarding fruit yield per tree, the Kalar collection had the highest yield, followed by Jammu, Paragpur, and Palodi.

iii) System Research

Development of Silvipastoral System for North Western Himalayan Region

A silvipastoral system was developed for the North Western Himalayan region using *Terminalia chebula* intercropped with grass species such as Setaria, Para grass, and Stylo, both as sole crops and in mixtures, and compared against a control (natural grass). The experiment was conducted in a randomized block design with tree spacing of 4 m × 4 m and grass spacing of 40 cm × 40 cm, replicated three times. Growth data for 2022-23 showed that the plant height of *T. chebula* ranged from 1.63 m to 2.73 m, while collar diameter ranged between 37.62 mm and 53.87 mm. The tallest height (2.73 m) and largest collar diameter (53.87 mm) were observed in treatment T_7, whereas the shortest height (1.63 m) and smallest collar diameter (37.62 mm) were recorded in treatment T_1. Among the intercropped species, the survival rate of *Stylosanthes hamata* (legume) was lower compared to the other grass species.

***Melia composita*-based agroforestry system for the region**

A *Melia composita* plantation was established at the experimental farm of the Division of Silviculture & Agroforestry, SKUAST-Jammu, with a spacing of 4 × 6 m. Intercropping trials involved two crops: Marigold (*Tagetes erecta*) varieties Pusa Narangi Gainda and Pusa Basanti Gainda, and Aloe vera. Initially, Marigold was cultivated as an intercrop, followed by Aloe vera, which remains under cultivation. While all crops demonstrated good performance under the *Melia composita* canopy, their yields were lower compared to the control. Among the

Marigold varieties, Pusa Narangi Gainda showed superior growth and yield compared to Pusa Basanti Gainda at all canopy distances (<1.2 m, 1.2–2.4 m, and 2.4–3.6 m). However, both varieties experienced reduced growth and yield when compared to their respective controls.

Dr. YS PARMAR UNIVERSITY OF HORTICULTURE & FORESTRY, NAUNI, SOLAN

i) Diagnostic and Design

The diagnostic survey conducted in the Pooh and Kalpa regions of Kinnaur district, Himachal Pradesh, revealed that farmers utilize 34 plant species from 27 families and 34 genera for traditional animal healthcare. Among these, the highest use value (UV) in ethnoveterinary practices was recorded for *Rumex nepalensis* (UV=0.80), followed by *Salix daphnoides* (UV=0.76) and *Heracleum lanatum* (UV=0.72). *Rumex nepalensis* was the most commonly used species, particularly for treating boils, indigestion, and insect bites, while *Salix daphnoides* was primarily used for managing foot and mouth disease and bone fractures.

ii) Tree Germplasm Collection, Evaluation and Improvement

The center has begun promoting the propagation of temperate tree species with considerable economic value, despite the challenges involved. Through these efforts, the center has successfully propagated *Myrica esculenta* and *Betula utilis*.

iii) System Research

The Morus alba-based agroforestry system significantly enhanced the growth and yield of *Pisum sativum* L., with notable improvements in traits such as plant height, number of branches, pod length, and overall yield. In contrast, *Capsicum annuum* L. exhibited better growth and yield characteristics, including plant height, number of branches, and fruit yield, when grown under sole cropping conditions. Additionally, the application of a treatment combining 50% Biochar and 50% of the recommended doses of inorganic fertilizers in both systems led to a substantial increase in the growth and yield of both capsicum and pea crops, while also improving soil fertility. In the peach-based agroforestry system, the growth and yield of *Pisum sativum* L. were significantly higher compared to open field conditions. In contrast, *Solanum lycopersicum* L. showed better growth and yield under open field conditions. In addition to the planting conditions, the application of humic acid (seaweed extract) with recommended doses of inorganic fertilizer, as well as protein hydrolysates with recommended doses of inorganic fertilizer, significantly boosted the yield of tomato and pea, respectively. Furthermore, the peach-based agroforestry system positively impacted soil properties, leading to notable improvements in nutrient availability, microbial activity, and moisture content. The combined application of RDF + humic acid and RDF + protein hydrolysates produced the most pronounced effects, enhancing soil nutrient levels and overall soil health.

The performance of cauliflower and pea crops was superior under the *Morus alba* L.-based agroforestry system compared to sole cropping, along with improvements in soil properties. Additionally, the application of RDF (Recommended Dose of Fertilizer) combined with humic acid and farmyard manure (FYM) further boosted crop production compared to the control condition. The Pea-Cauliflower-Morus alba agroforestry system, with the incorporation of RDF, humic acid, and FYM, resulted in higher net returns than other fertilizer and biostimulant treatments.

The evaluation of various agroforestry systems, along with natural forests and sole cropping systems, revealed that all tree-based systems had a higher capacity for storing very labile carbon, nitrate-N, and ammonical nitrogen, with natural forests exhibiting the highest values. In contrast, the non-labile carbon fraction was most prominent in the silvi-pasture system. Additionally, the carbon management index increased in all systems except for sole cropping.

A preliminary assessment was conducted to estimate the area under agroforestry in comparison to other major land-use systems using Sentinel-2 data, along with biophysical parameters, vegetation, soil, and water indices. The analysis showed that using eleven Sentinel-2 bands and three biophysical parameters provided an accurate estimation of agroforestry coverage in the Shimla district, which was found to occupy 29.10% of the district's total area, with an overall accuracy of 80.04% and a kappa coefficient of 0.76. The total carbon stored across different land uses in Shimla was 62.38 Tg, with 13.14 Tg from agroforestry. About 16-20% of the district's area was classified as highly suitable for agroforestry, while 24-25% was moderately suitable, and 4-6% was marginally suitable.

CSK HIMACHAL PRADESH KRISHI VISHWAVIDYALAYA, PALAMPUR

I) Diagnostic and Design

A questionnaire-based survey was conducted after a 10-year gap in the TAF system in Palampur and Band Bihar villages, Tehsil Palampur, District Kangra (HP). The survey highlighted significant changes in the demographic structure of participants, particularly in the basic education of rural women. The TAF system continued to have a notable impact on the livelihoods of rural women in the valley, with their contribution to family income rising from 51.3% in 2013 to 79% in 2023. Additionally, the average monthly family income increased from Rs. 4,827 to Rs. 11,867. Along with the rise in income, there was a corresponding increase in consumption and expenditure. In 2013, the average monthly family expenditure rose by 10% after women began working in the TAF system, whereas in 2023, this increase had surged to 59%.

ii) Tree Germplasm Collection, Evaluation and Improvement

Among the eight superior seed sources of *Toona ciliata* under field evaluation since 2012, the HPI(c) 22 seed source from Solan demonstrated the highest performance, achieving significantly greater height (10.91m), stem diameter (28.04cm), and canopy spread (7.29m) compared to all other sources. The next best-performing seed sources in terms of height and diameter at breast height (DBH) were HP5(b)71 and HP5(b)48 from Mandi, with HP5(b)71 being statistically comparable to HPI(c) 22 for height only. For canopy spread, HPI(c) 22 was followed by HP6(a)39, which was statistically similar to HP5(b)71. HP5(b)48 showed the highest annual increase in stem diameter (17.98%), while HP6(a)39 exhibited the highest annual increase in height (17.60%).

For *Sapindus mukorossi*, seed sources AS11 from Dhraman and AS5 and AS8 from Mangla, District Chamba, were the top performers in terms of height (8.17m, 7.81m, and 7.74m, respectively), all being statistically comparable to each other as well as to AS23 and AS3. AS8 recorded the highest DBH (8.55cm), followed by AS3 and AS11. In terms of canopy spread, AS3 saplings showed the greatest average expansion, followed by AS8 and AS5.

iii) System Research

Development of Harar-based Silvipastoral System for the North Western Himalayan Region (Common Experiment for Solan, Palampur, and Jammu Centres)

Various combinations of grasses and legumes had a significant impact on the growth parameters of both trees and grasses. *Terminalia chebula* exhibited the highest growth, reaching a height of 2.3m, a collar diameter of 8.35cm, and 15.72 secondary branches when grown with clover. The highest dry fodder yield was recorded in the Setaria + Clover combination, with 17,289.2 kg ha^{-1} of green fodder and 4,234 kg ha^{-1} of dry fodder, followed by pure Setaria. The carrying capacity of this agroforestry system, established on degraded land, declined from the maximum capacity of 6 cattle or 31 sheep in 2022-23 to a maximum of 2 cattle and 11 sheep in the current year.

Cutting treatments had a significant effect on the forage quality of the grasses and legumes, whether grown alone or in combination. Crude Protein (CP) percentage, Ether Extract, and useful minerals were highest during the second cut of Setaria and Brachiaria. Over a period of seven years, the percentage contribution of the tree component to total carbon sequestration increased, surpassing the contribution from the grass/legume cover. During the reporting period, the tree component contributed between 44.38% and 96.54% to the total carbon sequestration. The system that combined Harar with Setaria and White Clover was found to be the most profitable, generating net returns of Rs. 74,298 ha^{-1}.

Evaluation of *Leucaena leucocephala* Germplasm as Tree Fodder in a Silvipastoral Agroforestry System in the Mid-Hills of Himachal Pradesh

The two *Leucaena leucocephala* varieties, K-8 and K-636,

showed significant differences in their total fresh and dry fodder yields when evaluated within the silvipastoral system. The application of management practices once or twice a year enhanced the productivity of both varieties. Variety K-8 produced a significantly higher total dry fodder yield (1,132 kg ha^{-1}) when pollarded twice annually. A comparative study of different management practices revealed that while annual lopping produced the highest number of branches, pollarding twice a year resulted in the longest branches at both cutting periods (June and October), followed by pollarding once a year in the M_3 treatment.

The highest total tree fresh fodder production was observed in the M_4 treatment, which involved providing quality tree fodder twice a year, yielding 2,366.6 kg ha^{-1}, followed by the annual lopping treatment. Quality tree fodder can also be harvested in June to complement fodder yields from grasses. Setaria grass, grown between the rows of trees, was cut twice a year (in July and October) and significantly contributed to the overall productivity of the silvipastoral system. Nutritional analysis of the tree fodder harvested is currently underway.

Quantitative and Qualitative Evaluation of Different Varieties of *Morus alba* for Fodder Production under Mid-Hill Conditions of Himachal Pradesh

A qualitative and quantitative evaluation of five *Morus alba* varieties revealed interesting results when managed using pollarding and lopping (the farmer's practice). The total fresh fodder yield of two varieties, *China White* (V_1) and *Kanwa-2* (V_2), showed significant increases of 21.87% and 69.05%, respectively, when pollarded twice a year, compared to the farmer's practice of lopping. However, for the varieties *Ghoshuramay* (V_4) and *S-1635* (V_5), total yields were higher under the lopping treatment, with increases of 73.96% and 168.13%, respectively, compared to pollarding. Grazing by wild animals affected the yield performance of nearly all the varieties. In terms of quality, all five varieties were assessed for various nutritional parameters. *China White* (V_1) and *Kanwa-2* (V_2) had higher crude protein (CP) percentages and ether extract content compared to V_3, V_4, and V_5, which followed a similar pattern in nutrient composition. Over the three years of field evaluation, the nutritional analysis revealed that *China White* (V_1) and *Kanwa-2* (V_2) were the superior varieties in terms of quality and are therefore recommended for agroforestry systems, to be managed through pollarding. The *Ghoshuramay* (V_4) variety, when managed through lopping, performed best and was qualitatively superior to V_3 and V_5.

ASSAM AGRICULTURAL UNIVERSITY, HRS, KAHIKUCHI

i) Diagnostic and Design

In various locations of Loharghat village, Kamrup district, the practice of scattered plantations in field crop areas and live fencing around homesteads and other areas has gained popularity. The traditional agroforestry system in Assam is the homestead garden, where tree planting is often done informally and without clear zoning. In most homesteads, crops such as arecanut, coconut, banana, and black pepper are commonly grown, with fruit and forest zones often intermixed. Bamboo is traditionally the most important species in the forest zone, though in some areas, timber trees with market value have become the dominant component of this zone. In the horticulture-based agroforestry system, intercropping of dwarf species like pineapple, turmeric, and ginger with tall fruit trees such as guava and mango, along with minor fruits, is a common practice. Among forestry species, bamboo is the most popular, followed by teak, gomari, and sisu.

ii) Tree Germplasm Collection, Evaluation and Improvement

In June 2001, ninety-five saplings of *Gmelina arborea* were planted, sourced from 19 different seed locations. These saplings were collected from six distinct sites: 4 from Goalpara, 3 from Dudhnoi, 3 from Damara, 4 from Boko, 2 from Byrnihat, and 3 from Silchar. After 23 years, the trees from the Byrnihat seed sources (AAU 15 & AAU 16) reached heights of 29.13 m and 27.15 m, respectively, while those from Silchar (AAU 17 & AAU 18) measured 25.97 m and 27.83 m. In terms of diameter at breast height (DBH) after 22 years, AAU 18, AAU 17, AAU 15, and AAU 16 recorded values of 45.36 cm, 44.85 cm, 49.99 cm, and 51.48 cm, respectively. AAU 18 from Silchar exhibited the highest timber volume of 3.253 m^3 $tree^{-1}$, biomass of 1,789.47 Mg ha^{-1}, and above-ground carbon stock of 894.74 Mg ha^{-1}.

In 2023, a multi-location trial (MLT) was initiated to develop a clonal seed orchard of *Gmelina arborea* with insect-resistant traits. Insect-resistant clones—034, 116, 102,

109, and 002—were sourced from the Rain Forest Research Institute, Jorhat, Assam.

iii) System Research

***Acacia mangium-based* AF system**

The maximum plant height (16.30 m), dbh (35.97 cm), timber volume (411.98 m^3 ha^{-1}), tree biomass (511.35 Mg ha^{-1}), and above-ground carbon stock (252.42 Mg ha^{-1}) was recorded in intercrop plot where tree spaced at 5 m x 4 m. The maximum fodder yield of Hybrid Napier (50.98 t ha^{-1}) was obtained in sole fodder followed by tree spaced at 5 m x 6 m (46.78 t ha^{-1}), 5 m x 5 m (40.76 t ha^{-1}) and 5 m x 4 m (39.81 t ha^{-1}), respectively.

***Acacia mangium* for timber**

An average of 73 superior trees attained 26.3m plant height and 41.6 cm dbh, 9.16 m canopy diameter, and 438.7 m^3ha^{-1} timber volume in the 20th year. Timber volume and tree biomass of the standing tree were 438.7 m^3 ha^{-1} and 498.3 Mg ha^{-1} respectively. Above ground C stock observed was 246.05Mg ha^{-1}.

Jackfruit-based AF system

A tree height of 8.79 m was recorded in the intercrop plot whereas it was 8.45 m in tree without crop. The dbh (30.14 cm) of jackfruit was superior in the intercrop plot in comparison to the sole tree plot (29.51 cm). Timber volume, tree biomass, and above-ground C stock for jackfruit were higher in intercrop plots, being 60.12 m^3ha^{-1},104.55 Mg ha^{-1}, and 52.28 Mg ha^{-1}, respectively. However, the canopy diameter (8.16 m) was higher in sole jackfruit. Fruit yield of jack fruit was not increased in 17 years of plantation.

***Gmelina arborea* based agri-silvicultural system**

In the nearly 5th year plantation, maximum tree height (6.89 m) collar girth (30.88 cm) was observed insole tree plot and Cowpea-Toria sequence as intercrops, respectively. Max canopy diameter (2.45 m) was found in the GG-Toria sequence as intercrop. Maximum annual increment of tree height (423.53%), collar girth (309.13%) and canopy diameter (337.5%) recorded in GG-Toria sequence as intercrop. No remarkable yield reduction of intercrops was observed up to the 5th year of the plantation.

Growth pattern of *Melocanna baccifera*

Muli bamboo attained 11.69 m in height and 1335cm in girth at 18 years. The Mean yield of matured bamboo and B: C ratio were 32000 no. ha^{-1} and 3.51, respectively.

Growth pattern of *Bambusa balcooa*

Mean plant height (25.22 m), spread (5.21 m), new culm (21.45 no.), total culms (144.30 nos.), canopy diameter (32.42 m), biomass (185.25 Mg ha^{-1}) and harvestable yield (1276.4no. ha^{-1}) of *Bambusa balcooa* was recorded in 13 years after plantation.

Growth pattern of *Bambusa tulda*

Mean plant height (20.56 m), spread (3.79 m), new culm (31.67 no.), total culms (112.33 nos.), canopy diameter (11.49 m), biomass (225.76 Mg ha^{-1}) and harvestable yield (2249.3 no. ha^{-1}) was observed in *Bambusa tulda* in 13 years after plantation.

PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA

i) Tree Germplasm collection, evaluation and improvement

Poplar tree improvement: A trial involving 12 poplar clones was established at PAU Ludhiana to evaluate traits such as clear bole height, straightness, and biomass. The clones that showed higher clear bole height than the overall mean were ranked as follows: FNR-558 > L-247/84 > L-48/89 > L-170/88 > L-47/88 > WSL-29. For biomass, the clones with higher values than the overall mean were ranked in the following order: FNR-558 > Ranikhet > L-47/88 > FNR-544 > L-170/88 > L-247/84. Among these, FNR-558 consistently performed well in both clear bole height and biomass.

Shisham (*Dalbergia sissoo*): A zonal clonal trial for *Shisham* (*Dalbergia sissoo*) was conducted at three locations: PAU Ludhiana, GBPUA&T Pantnagar, and HAU Hissar. At the age of 7 years, the diameter at breast height (DBH) and height were recorded. The clone PS-52 ranked highest in terms of DBH, followed by PS-38 and PS-54. Four clones had lower

DBH values than the mean. In terms of timber volume, PS-54 recorded the highest value, outperforming all other clones except PS-52.

***Melia composita* Tree Improvement:** In 2016, a multi-locational trial of *Melia composita* was initiated to evaluate 20 progenies at PAU Ludhiana and 14 progenies at Ruldu Singh Wala, Bathinda. The superior progenies were selected, and seedlings were planted at a spacing of 4 x 2.5 m in a well-replicated and randomized block design. Significant differences in diameter at breast height (DBH) were observed after six years of growth. At Ludhiana, progeny 19 recorded the highest DBH at 21.83 cm, followed by progeny 20 (21.04 cm) and progeny 3 (20.37 cm). At Bathinda, progeny 14 had the lowest average diameter (13.8 cm), while progeny 3 had the highest (21.7 cm), followed by progeny 1 (21.1 cm).

In 2021, another trial was established to evaluate 15 FRI clones and 4 PAU progenies of *Melia composita*. The seedlings were planted at a spacing of 6 m x 4 m in a replicated and randomized block design. After two years of growth, the highest height was recorded in CL-2 (7.00 m) and FRI2035 (6.86 m), with CL-2 (11.43 cm) and FRI2035 (11.31 cm) also showing the highest DBH compared to the other clones.

ii) System research

Different spacing of poplar and intercrops : In March 2021, a poplar block plantation was established with two different spacing configurations: 10 m x 2 m and 8 m x 2.5 m, with a planting density of 500 $^{\text{plant ha}}$. After 3.5 years, the mean diameter at breast height (DBH) and height of the poplar trees planted at 8 m x 2.5 m spacing were recorded as 15.90 cm and 12.12 m, respectively. In contrast, the average DBH and height of trees planted at 10 m x 2 m spacing were 15.19 cm and 12.18 m, respectively. During both the *rabi* and *kharif* seasons, various crops such as wheat, mustard, garlic, pearl millet (fodder), and sorghum (fodder) were intercropped with the poplar trees.

In a series of experiments, 11 wheat varieties were evaluated under poplar conditions, with PBW 826 yielding the highest at 4955.07 kg ha^{-1}, followed by PBW 824 (4883.83 kg ha^{-1}) and PBW 725 (4419.50 kg ha^{-1}), outperforming the other varieties. To mitigate heat stress, wheat crops were sown at different dates under both poplar and open conditions, with plant bio-regulators applied. The results showed that a foliar application of potassium nitrate (2%) led to improved growth and a yield of 4522.9 kg ha^{-1}, while 800 ppm thiourea helped alleviate terminal heat stress. In mustard, the seed yield under poplar was highest in PBR357 (1890 kg ha^{-1}), followed by RCH 1 (1831 kg ha^{-1}), GSC7 (1790 kg ha^{-1}), and PHR 126 (1613 kg ha^{-1}). Garlic yielded better in open conditions (11054 kg ha^{-1}) than under poplar (9789 kg ha^{-1}). Among fodder crops, PCB 166 pearl millet had a significantly higher yield (32022.0 kg ha^{-1}) compared to PCB 165 (31197.2 kg ha^{-1}), and SL 46 sorghum outperformed SL 45, with yields of 31304.8 kg ha^{-1} and 30727.0 kg ha^{-1}, respectively.

GB PANT UNIVERSITY OF AGRICULTURE & TECHNOLOGY, PANTNAGAR

i) Diagnostic and Design

The Pati Block of Champawat District, Uttarakhand, located 18 km west of the district headquarters, was selected for a Diagnosis and Design (D&D) survey. Within this block, Gagar village was chosen randomly for the study. Farmers in the village were categorized into clusters based on their landholding size: marginal, small, medium, and large. The survey revealed that a majority of farmers in the area practice agroforestry and maintain home gardens. Farmers demonstrated significant awareness regarding the utility of tree fodder, with many using tree leaves as feed for livestock, particularly goats and milking animals. Additionally, silvicultural practices were commonly adopted for the extraction of wood and branches for household purposes. Notably, there was a strong inclination among farmers towards planting multi-purpose tree species to ensure that the produce could be utilized effectively during emergencies.

Crop and Fruit Profie

***Rabi* Crops**: Wheat (*Triticum aestivum*), Lentil (*Lens culinaris*), Mustard (*Brassica campestris*), Barley (*Hordeum vulgare*), Pea (*Pisum sativum*), Potato (*Solanum tuberosum*), Rai (*Brassica nigra*)

***Kharif* Crops**: Rice (*Oryza sativa*), Maize (*Zea mays*), Finger millet (*Eleusine coracana*), Cowpea (*Vigna unguiculata*), Black gram (*Vigna mungo*), Sorghum (*Sorghum bicolor*), Sesame (*Sesamum indicum*), Okra (*Abelmoschus esculentus*), Soybean (*Glycine max*), Green gram (*Vigna radiata*), Groundnut (*Arachis hypogaea*)

Winter Fruits: Orange (*Citrus sinensis*), Malta (*Citrus reticulata*), Lemon (*Citrus limon*)

Monsoon Fruits: Plum (*Prunus domestica*), Peach (*Prunus persica*), Pear (*Pyrus communis*), Mango (*Mangifera indica*

ii) Tree Germplasm collection, evaluation and improvement

Addition to Arboretum (2024-25)

During the year 2024-25, *Diploknema butyracea* (Chura: pqjk) was introduced to the arboretum.

Collection and Evaluation of Tree Species

In previous years, a collection of 94 indigenous and 54 exotic multipurpose tree species, including 7 indigenous and 6 exotic bamboo species, has been established. These species are under evaluation for their growth patterns, phenology, insect-pest prevalence, and disease incidence.

Poplar Germplasm Bank

A Poplar Germplasm Bank comprising 110 clones is being maintained at the Agroforestry Research Centre, Pantnagar, with a spacing of 80 × 60 cm.

Shisham Coordinated Trial

The Shisham Coordinated Trial, initiated in 2016, seeks to identify and recommend superior genotypes of Shisham (*Dalbergia sissoo*) for agroforestry systems. Conducted at five locations—Hisar, Ludhiana, Pantnagar, Ayodhya, and Pusa—the trial evaluates eight genotypes, comprising five from GBPUAT Pantnagar and three from PAU Ludhiana. The variability observed in measurements across these locations underscores the influence of environmental factors on genotype performance. Among the promising selections are PS 38 (Pusa, CSAHAU Hisar), PS 52 (PAU Ludhiana, NDAU Ayodhya), and PS 90 (GBPUAT Pantnagar). Notably, all the genotypes under evaluation were sourced from GBPUAT Pantnagar.

***Dalbergia latifolia* Coordinated Trial**

Mother Tree 34 has been identified as the tallest, followed closely by Mother Trees 5, 17, and 50, which also exhibit significant height potential. In terms of uniform collar diameter, most mother trees show suitability; however, Mother Tree 13 stands out with the highest mean collar diameter, whereas Mother Tree 3 has the smallest, making it less desirable in scenarios where larger diameters are preferred. Based on preliminary observations, Mother Tree 34 emerges as the most promising candidate overall..

iii) System Research

Poplar-Based Agrisilviculture System for the Tarai Region

A clonal poplar-based agrisilviculture system was introduced and promoted in the Tarai region, utilizing block plantation with a spacing of 5m × 4m and boundary plantation at 2.5m spacing. The system operates on a six-year rotation cycle, integrating crops effectively.

Eucalyptus-Based Agrisilviculture System for the Tarai Region

An eucalyptus-based agrisilviculture system was established and popularized. The block plantation is spaced at 5m × 2m, allowing intercropping during the first three years, while boundary plantations are spaced at 2.0m, enabling cropping up to the rotation age of five years for eucalyptus.

Bamboo-Based Agrisilviculture System for the Tarai Region

High-yielding genotypes of bamboo species, including *Bambusa balcooa*, *B. tulda, B. nutan, Dendrocalamus hamiltonii,* and *D. asper*, were introduced for agrisilvicultural systems. Block plantations were established at a spacing of 5m × 5m, and boundary plantations at 5m and 3m spacing, supporting successful intercropping during the first two years.

ACHARYA NARENDRA DEVA UNIVERSITY OF AGRICULTURE & TECHNOLOGY, KUMARGANJ, AYODHYA

I) Diagnostic and Design

Farmers in Uttar Pradesh, including those in the eastern parts and adjoining areas such as Pithla Village in Ayodhya and Dobhiyara Village in Sultanpur, are actively adopting the agri-silvi-horti system by cultivating guava as a fruit crop and turmeric as an agricultural crop. This system has proven to be highly profitable, with farmers earning substantial income from both crops. Additionally, the cultivation of *Casuarina equisetifolia* within this system has become increasingly popular due to its high demand in the brick industry and as fuelwood, further enhancing farmers' earnings. The agri-silviculture system is gaining widespread acceptance among farmers in Uttar Pradesh and neighboring regions, as it offers a significant income boost within a relatively short timeframe of 4-5 years from plantation. Under the Silvi-pastoral system, farmers are extensively growing Napier grass (*Pennisetum purpureum*) and berseem *(Trifolium alexandrinum)*. These fodder crops are

highly preferred by livestock, making them a favored choice compared to other grasses.

ii) Tree Germplasm Collection, Evaluation and Improvement

Shisham Germplasm/Clones:

Five germplasms of Shisham, namely PP-09, PP-16, PP-21, PP-22, and PP-39, were collected from HAU, Hisar, during 2015-16.

Additionally, three germplasms—Para-Sultanpur, Baraipara-Ayodhya, and Mawai-Barabanki**,** were sourced from local areas.

Among these, PP-39, PP-16, and PP-21 have exhibited superior growth in terms of tree height and diameter at breast height (DBH) compared to other germplasms from HAU, Hisar. The PS-54 clone also demonstrated remarkable height growth.

Shisham clones PS-20, PS-38, PS-52, PS-54, and PS-90 from Pantnagar, along with L-1, L-2, and L-5 clones from Ludhiana, were established in 2016.

In 2022, five progenies—Progeny-1, Progeny-2, Progeny-3, Progeny-4, and Progeny-5—were planted at the MES Agroforestry site.

The locally collected germplasm from Baraipara, Ayodhya, has consistently outperformed other locally sourced germplasms in growth since plantation.

Eucalyptus Germplasm:

Five Eucalyptus clones from ITC Bhadrachalam—EU-316, EU-2135, EU-3135, EU-416-A, and EU-416 were planted at the Ayodhya center in 2007-08.

Among these, EU-3135 and EU-2135 have shown superior performance compared to the others. However**,** EU-316, EU-416, and EU-416A have also exhibited notable growth in terms of plant height, DBH, and crown width.

iii) System Research

Agri-silviculture system: In the agri-silviculture system practiced in our area, cropping patterns involving paddy-wheat and paddy-mustard have shown superior performance compared to other crop combinations.

Paddy: The paddy variety Sarjoo-52 has consistently delivered better yields (22–24 q ha^{-1}) over the past 10–15 years under *Casuarina equisetifolia* and *Dalbergia sissoo*-based systems, outperforming other varieties.

Mustard: Among mustard varieties, *NDR-8501* (Narendra Rai-1), *Varuna*, and *Kranti* have demonstrated stable performance under both *Casuarina* and *Shisham* systems for the past 10–15 years. Recently, the variety *RH-725* has gained prominence, delivering impressive results over the last 4–5 years in both systems. In the 2023–2024 season, *RH-725* achieved a higher grain yield of 1.21 t ha^{-1} under *Casuarina equisetifolia*, surpassing *NDR-8501* (1.03 t ha^{-1}) and *Varuna* (0.98 t ha^{-1}). Similarly, under *Dalbergia sissoo*, *RH-725* produced a superior yield of 1.14 t ha^{-1} compared to *NDR-8501* (0.97 t ha^{-1}) and *Varuna* (0.95 t ha^{-1}).

Wheat: Under the *Casuarina equisetifolia*-based agri-silviculture system, the highest wheat grain yield (variety DBW-187) was recorded with the application of FYM (10 t ha^{-1}), achieving 2.53 t ha^{-1}, while the lowest yield was observed under the T_1 control treatment (recommended NPK), with 2.31 t ha^{-1}. Grain yield in open areas was 16.60% higher compared to the system with FYM application. A similar pattern was observed in wheat straw yield.

For the *Dalbergia sissoo*-based agri-silviculture system, the maximum wheat grain yield (variety DBW-187) was also achieved with FYM application (10 t ha^{-1}), reaching 2.45 t ha^{-1}, while the lowest yield was observed with paddy-straw application (15 t ha^{-1}), yielding 2.14 t ha^{-1}. Open areas recorded 21.63% higher grain yield compared to the system with FYM application. A similar trend was evident for wheat straw yield as well.

Agri-Silvi-Horti System

A significantly higher rhizome yield (7.19 t ha^{-1} $year^{-1}$) was achieved with the application of 50% NPK + 50% FYM, compared to the open area yield of 8.57 t ha^{-1} $year^{-1}$. Notably, both systems exhibited significant yield variations based on the different treatment combinations applied.

The maximum guava yield (6.81 t ha^{-1} $year^{-1}$) was recorded with 50% NPK + 50% FYM, while the lowest yield (5.23 t ha^{-1} $year^{-1}$) was observed under T_1 with 100% NPK (120:80:80 kg ha^{-1}).

For pruned biomass, the highest yield (5.10 t ha^{-1} $year^{-1}$) was obtained with 50% NPK + 50% FYM, whereas the lowest biomass (4.17 t ha^{-1} $year^{-1}$) was recorded with 100% NPK (180:80:80 kg ha^{-1}).

Silvi-Pastoral System

The maximum tree growth increment was observed when *Pennisetum purpureum* (Napier grass) was combined with *Dalbergia sissoo* trees, while the minimum diameter at breast height (DBH) increment occurred in the *Panicum maximum* and *D. sissoo* combination. The green herbage

yield was highest for *P. purpureum* (42.19 t ha^{-1}) and lowest for *Brachiaria mutica* (23.03 t ha^{-1}). A similar trend was noted for herbage yield on a dry-weight basis.

Dr. RAJENDRA PRASAD CENTRAL AGRICULTURAL UNIVERSITY, PUSA SAMASTIPUR

i) Diagnostic and Design

A diagnostic and design (D&D) survey conducted across 37 villages in Pusa Block, Samastipur, Bihar, aimed to evaluate agroforestry practices and identify tree-based systems and the utility patterns of farm-based tree resources among the local population. The survey documented six prominent tree-based systems: Semul + Broad Bean + Rice, Mango + Wheat + Rice, Mahogany + Lemon + Mustard + Turmeric, Litchi + Wheat + Turmeric, Mahogany + Mausmi + Broad Bean + Maize, and African Mahogany + Wheat + Rice.

Among these, litchi-based systems excelled in terms of volume, biomass, and carbon stock accumulation, while all systems contributed to enhancing the soil's physico-chemical and biological properties. The study revealed that per capita fuelwood consumption (kg capita^{-1} day^{-1}) in Pusa Block was significantly supported by agroforestry systems, with fuelwood supplied from forests and adjacent areas being almost half of that provided by agroforestry. Fuelwood consumption was notably higher during winter. However, per capita fodder consumption (kg ACU^{-1} day^{-1}) by cattle indicated that agroforestry systems made negligible contributions to fodder supply, as tree-based fodder utilization was uncommon in the region.

ii) Tree Germplasm Collection, Evaluation and Improvement

The evaluation efforts include assessing the growth and productivity of 18 different clones of poplar plantations and examining the performance of eight Shisham (*Dalbergia sissoo*) genotypes for agroforestry systems in the Indo-Gangetic Region. Additionally, 400 seedlings representing 21 genotypes of Malabar neem (*Melia dubia*), 200 seedlings spanning 23 genotypes of Shisham (*Dalbergia sissoo*), and 200 seedlings of Indian rosewood (*Dalbergia latifolia*) are being studied.

iii) System Research

Development of agroforestry management practices for Eucalyptus based agroforestry system

An experiment was conducted to evaluate the impact of varying tree spacing on turmeric yield and soil organic carbon under an 8-year-old *Bombax ceiba* plantation with spacings of 5×2 m, 5×3 m, 5×4 m, and 5×5 m, as well as treeless open plots. The results showed that turmeric yield (*Curcuma longa* var. Rajendra Sonia) decreased with increasing tree density, with yields of 25.20 Mg ha^{-1} in open plots and progressively lower yields under plantations: 21.15 Mg ha^{-1} at 5×5 m, 20.37 Mg ha^{-1} at 5×4 m, 18.64 Mg ha^{-1} at 5×3 m, and 16.87 Mg ha^{-1} at 5×2 m spacing. The corresponding reductions in yield compared to open plots were 16.1%, 19.2%, 26.0%, and 33.1%, respectively. Despite the yield reductions, soil organic carbon stock (0–30 cm) was significantly higher under the plantations, ranging from 17.00 Mg ha^{-1} at 5×5 m spacing to 21.85 Mg ha^{-1} at 5×2 m spacing, compared to 13.71 Mg ha^{-1} in the treeless open plots, indicating a 24.0–59.4% increase in organic carbon under tree-based systems. Based on these findings, it is recommended to adopt *Bombax ceiba* plantations at a 5×5 m spacing as a viable agroforestry practice for growing turmeric, balancing yield reduction with enhanced soil organic carbon sequestration.

ORISSA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY, BHUBANESHWAR

i) Diagnostic and Design

Survey was conducted in the village of Agapala, Block Kujanga, District Jagatsinghpur, to assess the current status of homestead agroforestry and identify suitable management practices for improving the productivity and sustainability of the system. The survey focused on evaluating the production functions of various perennial and annual tree components, along with their service functions such as windbreaks, shading, fertility improvement, and soil and water conservation. Additionally, an economic evaluation of each component of the homestead agroforestry system was carried out.

ii) Tree Germplasms Collection, Evaluation and Improvement

To assess the relative growth performance of *Eucalyptus tereticornis* clones, eight different clones were selected for potential use in plantation programs in Coastal Odisha conditions. Among them, two clones are from JK Industries, Raygada (JKSCED, JKSCEU), three from FRI, Dehradun (FRI-ET-31, FRI-ET-32, FRI-ET-35), and three from TNAU, Mettupalayam (ET MPT 13, ET MPT 29, ET MPT 31). These clones were planted in a 3x3 m² spacing with a Randomized Block Design (RBD) and three replications. The plantation was established during *Kharif* 2023 at the Agroforestry Research Station, OUAT, Bhubaneswar.

The second evaluation focused on the relative growth and biomass production of *Casuarina equisetifolia* clones, conducted during *Kharif* 2024. Six clones were sourced from IFGTB, Coimbatore (CH-1, CH-2, CH-4, CH-5, CESSO, PV-31), one from JK Industries, Raygada (JK-60), and a local check (Puri local). These clones were also planted in a 3x3 m² spacing with RBD and three replications.

The third evaluation trial focused on the growth and biomass production of *Melia dubia* clones and involved seven clones collected from FRI, Dehradun (G-231, G-2096, G-76, G-15, G-271, G-2059, and G-241). These clones were planted in *Kharif* 2024 in a 3x3 m² spacing with RBD and three replications.

iii) System Research

Fruit-Based Agri-Silvi-Horticultural System

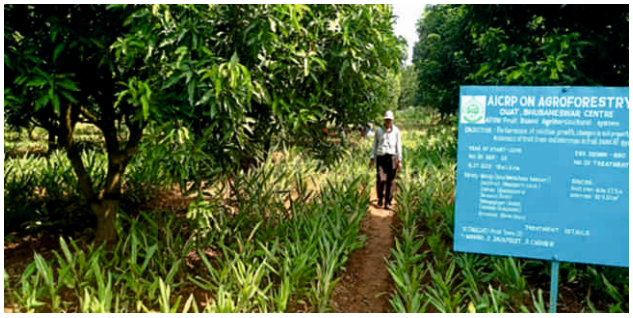
Growth parameters of fruit tree species, including height, collar girth, and crown spread, were highest in Jackfruit, measuring 8.91m, 80.32cm, and 7.98m, respectively, at 90 months after planting. Similarly, growth parameters of intercrops, such as plant height, number of leaves, and number of tillers per plant, were maximum in Mango-ginger, with values of 125.21cm, 10.38 leaves, and 6.71 tillers, respectively, at 240 days after planting (DAP). The maximum tree biomass was 2061 kg $ha^{-1}$for Mango-ginger, while the highest dry biomass of intercrops (14100 kg ha^{-1}) was found in Jackfruit, measured at 90 months after planting. The highest plant carbon stock, CO_2 assimilation, and overall system carbon stock were recorded as 377.8 kg ha^{-1}, 3469 kg ha^{-1}, and 945 kg ha^{-1}, respectively, in Jackfruit. Regardless of the season, Mango and Jackfruit showed superior soil moisture retention compared to other fruit trees. The highest soil pH (5.22) was recorded in the control subplot, while Jackfruit exhibited the highest electrical conductivity (EC) value of 0.28 dS m^{-1}. In terms of soil organic carbon content, the highest values were observed in the Jackfruit and Mango-ginger subplots, reaching 6.21 g kg^{-1}. Nutrient content analysis revealed that Jackfruit had the highest levels of available nitrogen (356.46 kg N ha^{-1}), available phosphorus (24.85 kg P ha^{-1}), and available potassium (114.35 kg K ha^{-1}). Among the subplots, Mango-ginger recorded the highest available nitrogen (355.75 kg N ha^{-1}) and phosphorus (25.21 kg P ha^{-1}) values, while the highest available potassium (114.60 kg K ha^{-1}) was found in the Colocasia subplot. In terms of economic returns, Mango-ginger generated the highest gross return (Rs. 5.40 lakhs per ha), net return (Rs. 4.23 lakhs per ha), and Benefit-Cost Ratio (BCR) of 3.25.

Silvipastoral system

To develop location-specific silvipastoral systems for rainfed cultivable fallow and wasteland in coastal areas, an experiment was initiated in the *Kharif* season of 2015, involving three multipurpose tree species (MPTs): *Acacia mangium*, *A. auriculiformis*, and *Samanea saman*, along with Guinea grass, Thin Napier, and Setaria grasses. The highest green foliage yield (14.1 t ha^{-1}) was obtained from Guinea grass under *Acacia mangium*, followed by *A. auriculiformis* and *Samanea saman*. The highest carbon sequestration (112 Mg ha^{-1}) occurred in *A. mangium* with Setaria, followed by *A. mangium* with Guinea (102 Mg ha^{-1}). The yield recovery percentage was highest for Guinea grass, with a 60% increase compared to open conditions. *Acacia mangium* demonstrated the highest soil moisture retention during the post-rainy season (September-November), irrespective of the intercrops. Solar radiation interception was lowest in *A. mangium*, followed by *A. auriculiformis* and *S. saman* throughout the season, due to their dense foliage, which also led to a significant reduction in grass productivity. The highest benefit-cost ratio based on net returns was obtained from Guinea grass (2.59) in association with *A. mangium*, followed by Guinea with *S. saman* (2.57). In open conditions, the benefit-cost ratio for fodder crops was highest for Guinea (1.56), followed by Thin Napier (1.52).

Gambhar-based agrisilvicultural system

This experiment, conducted across the humid and sub-humid zones of India at centers in Kaikuchi, Jhargram, Ranchi, and Bhubaneswar, was initiated in the *Kharif* season of 2016. It involved seven treatments, combining three legume crops (Arhar, Cowpea, and Greengram) in *Kharif* with Toria in the *Rabi* season, under residual soil moisture conditions. The combination of *Gmelina arborea* with Greengram-Toria recorded the highest growth parameters, including plant height, crown spread, and basal girth, followed by *G. arborea* with Cowpea-Toria. After the harvest of the annual legume crops from the interspaces, the highest soil test values for available nitrogen (269.5$^{kg/ha}$) and potassium (126.1$^{kg/ha}$) were found in the Greengram-Toria combination, followed by Cowpea-Toria. The highest Arhar equivalent yield (25.48$^{q/ha}$) with a Benefit-Cost Ratio (BCR) of 1.47 was observed in the *Gmelina arborea* + Cowpea-Toria system. In sole cropping conditions, Cowpea-Toria produced the highest Arhar equivalent yield (13.2$^{q/ha}$) with a BCR of 1.01. Sole cropping yielded higher results compared to the system due to the shading effect of the trees.



BIDHAN CHANDRA KRISHI VISHWA VIDYALAYA, RRS, JHARGRAM

I) Diagnostic and Design

The survey was conducted among farmers in the Binpur-I and Binpur-II blocks of Jhargram District, West Bengal. The objectives included enhancing biomass productivity, promoting trees outside forests, generating income and employment opportunities, and improving nutritional intake. Based on the findings of the survey, agroforestry technologies were designed to prioritize productivity, sustainability, and adaptability. These technologies were piloted on 2.81 hectares in Ramnagar Mauza, along with two additional plots measuring 42 and 63 decimals in Jamda and Asanboni Mauza, respectively. Mango trees (*Amrapali* variety) were planted at a spacing of 10m x 10m, interspersed with *Gmelina arborea* to enhance productivity. *Dysoxylum binectariferum* was planted along field bunds as a boundary crop. Pigeon peas and vegetables were grown as alley crops, managed alongside other arable crops. Regular monitoring and maintenance ensured the successful establishment of multipurpose tree species (MPTs), with gap-filling undertaken as needed. This initiative supports sustainable agroforestry practices while aiming to increase farmers' incomes and promote dietary diversity through the integration of crops and trees.

ii) Tree Germplasm collection, evaluation and improvement

A study on the germplasm collection, evaluation, and improvement of two multipurpose tree species, *Acacia auriculiformis* and *Gmelina arborea*, was conducted across the Red and Laterite Zone of West Bengal to assess growth parameters such as plant height, bole height, and diameter at breast height (DBH), and timber volume yield. For *Gmelina arborea*, twelve accessions planted in 2005 exhibited plant heights ranging from 10.7 to 13.9 meters, with the highest timber volume yield of 0.19 m³ per tree recorded in Bhutabeda, Binpur. Another six accessions planted in 2010 showed moderate growth, with plant heights between 10.2 and 12.1 meters and volume yields from 0.087 to 0.148 m³.

For *Acacia auriculiformis*, the 2002 accessions demonstrated robust growth, achieving DBH values up to 36.2 cm and a peak volume yield of 1.001 m³ in Medinipur. Accessions planted in 2005 showed diverse growth traits across 16 sites, reflecting strong adaptability, while those planted in 2010 yielded volumes ranging from 0.177 to 0.227 m³. These evaluations highlight the significant growth potential, adaptability, and productivity of these species for agroforestry systems and sustainable forestry in the region. Notably, two accessions of *Gmelina arborea* (Acc. No. 6/2007 and 5/2012) and three accessions of *Acacia auriculiformis* (Acc. No. 1/2006, 4/2009, and 2/2014) were identified as superior based on long-term biometric observations, offering valuable insights for future breeding programs.

iii) System research

Effect of pulse-millet alley crops on growth and system productivity of *Melia dubia* - *Citrus sinensis* agroforestry system

The study on the *Melia dubia-Citrus sinensis* agroforestry system aimed to evaluate growth performance, soil

fertility, and economic viability under different intercrop combinations in the red and laterite zone of Jhargram, India. Conducted using a randomized block design with nine treatments, the experiment included various combinations of cowpea and finger millet as intercrops: T_1 (*M. dubia*), T_2 (*C. sinensis*), T_3 (*M. dubia - C. sinensis*), T_4 (*M. dubia +* cowpea), T_5 (*C. sinensis + cowpea*), T_6 (*M. dubia - C. sinensis +* cowpea), T_7 (*M. dubia + cowpea +* finger millet), T_8 (*C. sinensis* + cowpea + finger millet), and T_9 (*M. dubia - C. sinensis* + cowpea + finger millet).

Significant differences in growth and soil fertility were observed across treatments. *M. dubia* exhibited maximum growth in T_9 (3.54 m), while *C. sinensis* reached its tallest height in T_3 and T_6 (1.37 m). Soil fertility improved significantly, with T_3 (*M. dubia - C. sinensis* - cowpea) recording the highest levels of available nitrogen (219 kg ha^{-1}) and phosphorus (55.85 kg ha^{-1}). Organic carbon levels remained high across treatments, with a peak of 3.9 kg ha^{-1}.

Economically, T_7 (*M. dubia +* cowpea + finger millet) provided the highest cowpea equivalent yield (2.95 t ha^{-1}) and gross return (Rs. 76,810 ha^{-1}). However, the best benefit-cost ratio (BCR) of 3.36 was recorded in T_5 (*C. sinensis +* finger millet), showcasing the economic advantage of integrating finger millet with *C. sinensis*. This agroforestry system demonstrates strong potential for improving productivity and economic returns in semi-arid, rainfed regions.

Combined effect of alley cropping and mulching on growth and system productivity of *Gmelina arborea* – *Zizyphus mauritiana* agroforestry system

An experiment initiated in 2020-21 evaluated the impact of alley cropping and mulching on the early growth of the *Gmelina arborea* and *Zizyphus mauritiana* (gamhar-ber) agroforestry systems under rainfed upland conditions in humid and sub-humid regions. The study aimed to assess growth, productivity, and economic returns, as well as the influence of mulching and arhar intercropping on soil moisture and fertility. Six treatments were implemented, including control, black plastic mulch, biodegradable mulch, and combinations of these with arhar intercropping. Results indicated that mulching significantly enhanced growth parameters of gamhar, such as diameter, height, and crown spread while intercropping with arhar improved soil organic carbon, nitrogen, and phosphorus levels. The best growth and productivity outcomes were achieved with treatments combining mulching and arhar intercropping. Economic analysis demonstrated increased system profitability, with net returns improving by up to 24% through arhar inclusion and by 19% with mulching. This agroforestry model, particularly when integrating mulching and intercropping, offers a promising strategy for boosting productivity and profitability in rainfed upland farming systems.

Impact of African mahogany-sweet orange agroforestry system on phytoremediation and ecosystem services in arsenic-contaminated rice fields of the Bengal basin

The use of arsenic (As)-contaminated groundwater for irrigation in the Bengal basin has led to significant As accumulation in paddy soils and rice, posing severe health risks to billions globally. To address this issue, an agroforestry approach incorporating forest and horticulture trees into contaminated rice fields was explored for its potential to facilitate phytoremediation and enhance ecosystem services. A field experiment, conducted from 2018 to 2019 on As-contaminated clay loam in West Bengal, India, evaluated the integration of African mahogany (*Khaya anthotheca*), sweet orange (*Citrus sinensis* cv. Malta), and a rice-rice cropping system, both individually and in combinations. Compared to the sole rice-rice cropping system, arsenic levels in rice grown in the alleys of a red mahogany + sweet orange-based agroforestry system decreased significantly from 798 µg kg^{-1} to 226 µg kg^{-1}. Additionally, total As removal was 2.6 times higher in the agroforestry system, and total As concentration in the 0–20 cm soil layer was 1.4 times lower after four years of implementation. Sweet orange roots absorbed 28.5 mg kg^{-1} As, while shoots accumulated 6.5 mg kg^{-1} As. However, orange juice contained only 11.5 ppb As, meeting safe consumption standards. This agroforestry system also yielded multiple ecosystem products, including rice grains, sweet oranges, fuelwood, and timber, and was 2.5–3.0 times more profitable than the conventional rice-rice system. With 1–1.3 times higher annual biomass production, the system enhanced climate resilience by offsetting greenhouse gas emissions and improving soil nutrient status and biodiversity. The Composite Evaluation Index revealed that the agroforestry system provided 5.05, 3.20, and 1.99 times higher multifunctional ecosystem services compared to agriculture (rice-rice), horticulture (sweet orange), and forestry (African mahogany), respectively. This study highlights the potential of a forest tree–fruit tree agroforestry system for remediation and delivering extensive ecosystem benefits in arsenic-contaminated rice fields of the Bengal basin.

BIRSA AGRICULTURAL UNIVERSITY, RANCHI

I) Tree Germplasm Collection, evaluation and improvement

Seeds from seven different sources of *Gmelina arborea* (gamhar) were collected in 2024 from various regions, including Assam, West Bengal, and Jharkhand. These seeds were sown in the Faculty Nursery for evaluation, and data collection is currently underway.

ii) System Research

Evaluation of Gmelina arborea based Agri-Silvicultural System

In this system, three crops—black gram (*Vigna mungo*), pigeon pea (*Cajanus cajan*), and cowpea (*Vigna unguiculata*)—were cultivated during the *kharif* season, while mustard (*Brassica juncea*) was grown during the *rabi* season. After six years of experimentation, the findings revealed that the highest height increment in *Gmelina arborea* (0.89 m) occurred in combination with *V. unguiculata*, followed by 0.74 m in sole *G. arborea*. The lowest height increment (0.67 m) was observed in the combination of *G. arborea* with *C. cajan*. The maximum DBH increment (2.55 cm) was recorded in the *G. arborea* + *V. unguiculata* combination, followed by 1.92 cm in the *G. arborea* + *V. mungo* combination, with the minimum increment (0.80 cm) in sole *G. arborea*. Grain yield was highest (14.70 q/ha) for green gram (*V. mungo*) in the *G. arborea* + *V. mungo* combination, while the lowest black gram equivalent yield (7.03 q ha^{-1}) was recorded in the *G. arborea* + *C. cajan* combination. For mustard, the maximum seed yield (7.17 q ha^{-1}) was achieved in the *G. arborea* + *V. mungo* + mustard combination, followed by sole mustard during the *rabi* season. Total biomass, carbon stock, and carbon sequestration were highest in the *G. arborea* + *V. unguiculata* treatment, with values of 15.13 t ha^{-1}, 7.11 t ha^{-1}, and 26.09 t ha^{-1}, respectively, followed by the *G. arborea* + *V. mungo* treatment (12.81 t ha^{-1}, 6.02 t ha^{-1}, and 22.10 t ha^{-1}, respectively). The lowest values were recorded for sole *G. arborea* (8.20 t ha^{-1}, 3.85 t ha^{-1}, and 14.14 t ha^{-1}, respectively).

Performance of Fodder crops with Bakain (*Melia azedarach*) Tree Species under the Silvi-Pastoral System

In this system, four fodder crops—*Stylosanthes hamata* (Stylo), *Arachis glabrata* (Charabadam), *Pennisetum purpureum* (Napier grass), and Para grass—were evaluated for their forage yield in combination with *Melia azedarach* (Bakain tree). After six years of experimentation, the results showed that the tallest *M. azedarach* trees (3.62 m) were observed in the *M. azedarach* + *S. hamata* combination, while the shortest trees (2.64 m) were recorded in the *M. azedarach* + *P. purpureum* combination. The highest DBH increment (0.29 cm) was also noted in the *M. azedarach* + *S. hamata* treatment, with the lowest (0.10 cm) in *M. azedarach* + *P. purpureum*. In terms of fodder yield, *M. azedarach* + *P. purpureum* produced the highest yield (1233.4 q ha^{-1}), followed by *M. azedarach* + *A. glabrata* (481.2 q ha^{-1}), while the lowest fodder yield (339.2 q ha^{-1}) was recorded in *M. azedarach* + *S. hamata*. The total biomass, carbon stock, and carbon sequestration were highest in the *M. azedarach* + *S. hamata* combination, with values of 30.67 t ha^{-1}, 15.33 t ha^{-1}, and 56.27 t ha^{-1}, respectively. This was followed by the *M. azedarach* + *A. glabrata* treatment, which recorded values of 18.30 t ha^{-1}, 9.15 t ha^{-1}, and 33.58 t ha^{-1}, respectively. The lowest values were recorded in the *M. azedarach* + *P. purpureum* combination, with 2.31 t ha^{-1}, 1.16 t ha^{-1}, and 4.24 t ha^{-1}, respectively.

Performance of field crops in the Alley of Tephrosia

In this experiment, five *kharif* crops—peanut, finger millet, black gram, soybean, and sesame—and five *rabi* crops—gram, lentil, linseed, mustard, and field pea—were evaluated. After five years of experimentation, the highest black gram equivalent yield (18.90 q ha^{-1}) was observed in groundnut under the treatment combination *Tephrosia* + groundnut, while the lowest (3.71 q ha^{-1}) was recorded in sesame under *Tephrosia* + sesame. For *rabi* crops, the highest mustard equivalent yield (14.97 q ha^{-1}) was recorded in lentil under the *Tephrosia* + lentil treatment, whereas the lowest yield (5.48 q ha^{-1}) was observed in mustard under *Tephrosia* + mustard.

CHAUDHARY CHARAN SINGH HARYANA AGRICULTURAL UNIVERSITY, HISAR

I) Tree Germplasm Collection, evaluation and improvement

Eucalyptus: 4 clones

Shisham (*Dalbergia sissoo*): 5 clones from GBPUAT Pantnagar and 3 clones from PAU, Ludhiana

Burma dek (*Melia composita*): 18 genotypes

Casuarina: Four species—Casuarina junghuhniana, CH-1, CH-5, and Casuarina equisetifolia

***Melia composita* Tree Improvement**

A trial involving 18 progenies of *Melia composita* was established at the Forestry Research Farm, CCS HAU Hisar, with trees planted at a spacing of 8 × 3 m in the first week of February 2016. After eight years, the basal diameter of the progenies ranged from 20.8 cm to 32.9 cm, with an average

of 25.3 cm, indicating significant genetic variability among the selected germplasm. The progeny MCPAU1 from Punjab exhibited the highest diameter at breast height (DBH), followed by MCB2 from Haryana.

Shisham (*Dalbergia*) Tree Improvement

A zonal clonal trial for *Dalbergia sissoo* was conducted at three locations: PAU, Ludhiana; GBPUA&T, Pantnagar; and CCS HAU, Hisar. Elite clones from G.B. Pant University of Agriculture and Technology (Pantnagar) and Punjab Agricultural University (Ludhiana) were planted at a spacing of 4 × 2.5 m in the research field in August 2016. At seven years after planting, the basal diameter of the clones ranged from 11.88 cm to 17.62 cm, with an average of 14.74 cm. The highest DBH (13.66 cm) was observed in clone PS-38, followed by PS-90 (12.22 cm), while the lowest (9.68 cm) was recorded in PS-54.

Evaluation of Four Casuarina Species

Four species of Casuarina (*Casuarina junghuhniana*, CH-1, CH-5, and *Casuarina equisetifolia*) were transplanted in September 2020 at three different spacings: 4 × 3 m, 5 × 3 m, and 6 × 3 m. At the time of planting, the mean height of the species ranged from 0.67 m to 0.69 m, and basal diameter ranged from 1.21 cm to 1.24 cm. After three years, the highest DBH (13.1 cm) was recorded in *Casuarina junghuhniana* planted at a 5 × 3 m spacing.

ii) System research

Different Spacings of Poplar and Intercrops

One-year-old saplings of *Populus deltoides* were transplanted between January 30 and February 2, 2017, at six different spacings: 3×3 m, 4×3 m, 5×3 m, 6×3 m, 7×3 m, and 8×3 m. At the time of transplantation, the mean height, basal diameter, and diameter/girth at breast height (DBH/GBH) of the poplar saplings were 5.46 m (18.1 ft), 3.51 cm, and 2.83/8.9 cm, respectively. After seven years, poplar trees planted at 8×3 m spacing exhibited the highest GBH (75.5 cm), which was 16.68% higher than the trees planted at the closest spacing (3×3 m). The highest grain yield (2.22 t ha^{-1}) was recorded in wheat variety HD-2967, closely followed by WH-711 (2.05 t ha^{-1}), both planted at the wider 8×3 m spacing. The greatest reduction in grain and straw yield was observed in wheat variety WH-1105 (87.23% and 86.01%, respectively) at 3×3 m spacing, followed by WH-711 (80.90% and 81.20%) and HD-2967 (78.43% and 77.76%).

Bund Planted Eucalypts and Poplar

Growth of Poplar

Poplar trees planted in February 2015 in the East-West direction attained an average DBH of 30.7 cm at the age of 9 years, while poplar trees planted in the North-South direction had a mean DBH of 24.3 cm.

Growth of Eucalypts

Eucalypts planted in the East-West direction reached a DBH of 31.3 cm, while those planted in the North-South direction had a DBH of 27.9 cm.

Different Spacings of Casuarina Species and Intercrops

Four species of *Casuarina*—*Casuarina junghuhniana*, CH-1, CH-5, and *Casuarina equisetifolia*—were transplanted in September 2020 at three different spacings: 4×3 m, 5×3 m, and 6×3 m. At the time of plantation, the mean height of the species ranged from 0.67 m to 0.69 m, and the basal diameter ranged from 1.21 cm to 1.24 cm. After three years, *Casuarina junghuhniana* planted at the 5×3 m spacing exhibited the highest DBH (13.1 cm).

SRI KARAN NARENDRA AGRICULTURE UNIVERSITY, RRS, FATEHPUR SHEKHAWATI

i) Diagnostic and Design

A survey conducted this year in Garinda village, Fatehpur tehsil, Sikar, highlighted key details about the area. The village spans 1128 hectares with a population of 3,637, comprising 1,882 males and 1,755 females across 596 households. The landscape features sand dunes and inter-dunal sandy plains with poorly developed drainage; seasonal streams dry up after traveling short distances through sandy fields. Irrigation, limited to areas with good groundwater potential, relies on wells and tubewells. Major *Kharif* crops include pearl millet, green gram, cluster bean, cowpea, sesame, and moth bean, while *Rabi* crops like wheat, barley, mustard, and gram are cultivated in irrigated fields. *Ailanthus*

excelsa is commonly planted along farm boundaries, while *Prosopis cineraria* and *Tecomella undulata* are traditionally found in agricultural fields. Wasteland and panchayat land are home to species like *Capparis decidua*, *Acacia tortilis*, *Ziziphus nummularia*, and *Prosopis juliflora*. Progressive farmers have introduced horti-agriculture models with fruit species such as beal, pomegranate, ber, and citrus. Additionally, some farmers use *Acacia senegal* (locally known as khairi) as live fencing to protect crops from animals. Livestock farming, including buffalo, cows, and goats, is a key component of rural livelihoods in the village.

The village covers a total geographical area of 1128 hectares, with approximately 90 hectares under irrigation. The annual rainfall ranges between 300-400 mm, and the temperature fluctuates from a maximum of 48°C to a minimum of 2°C. The population stands at around 4500. Major crops include pearl millet, green gram, cluster bean, cowpea, sesame, and moth bean during the *Kharif* season, while wheat, barley, mustard, and gram dominate the *Rabi* season. Orchards with aonla, beal, pomegranate, ber, and citrus species are also cultivated. Traditional agroforestry systems comprise agri-silviculture with *Prosopis cineraria* and *Tecomella undulata* or *Ailanthus excelsa* alongside *Kharif* crops and agri-horticulture with beal, pomegranate, ber, and citrus plantations. Key tree species on farms include *Prosopis cineraria, Tecomella undulata, Ailanthus excelsa, Azadirachta indica,* and *Ziziphus* species, which are also preferred for agroforestry. Forest-based activities like the collection of Ker, Ber, Kakoda, Kareli, and honey, alongside sawmills and furniture production, support minor industries. Government-led forestry plantation programs, aided by NHM, RKVY, and Panchayat schemes, promote tree planting. Recommended agroforestry systems include agri-silviculture and agri-horticulture models integrating various trees with crops, as well as silvipasture systems for wastelands. However, challenges to adopting agroforestry practices include limited landholdings, long tree rotation periods, inadequate planting material, lack of dedicated government programs, insufficient extension work, fear of forest department formalities, and unorganized markets.

ii) Tree Germplasm collection, evaluation and improvement

The Centre was initially assigned two multipurpose tree species (*Prosopis cineraria* and *Dalbergia sissoo*) during the AICRP on Agroforestry group meeting. However, due to the poor growth performance of *D. sissoo* in un-irrigated sandy soils, the species was replaced in the 2013-14 group meeting. Since 2014-15, the Centre has focused solely on *Prosopis cineraria* (*Khejri*), with a collection comprising 13 provenances from Gujarat, 15 plus tree germplasms, and six location-specific germplasms from Rajasthan (Bikaner, Jhunjhunu, Churu, Sikar, Jaipur, Nagaur) and one from Haryana. Growth performance studies indicated that among the Rajasthan provenances, Raj 6 exhibited superior growth, achieving a mean tree height of 1.80 m and a mean collar diameter of 4.5 cm after eight years. For the Gujarat provenances, the 22-year-old *P. cineraria* PGC-2 (Bhuj) demonstrated better performance with a mean tree height of 3.5 m and a mean DBH of 14.20 cm. Additionally, growth evaluation of 20-year-old plus trees revealed that the PCF 15 provenance recorded the highest tree height (4.95 m) and DBH (15.5 cm).

iii) System Research

Ailanthus excelsa-based agri-silviculture system

In a 7-year-old *Ailanthus excelsa-based* agri-silviculture system under rainfed conditions, the average tree height ranged from 3.1 m to 5.8 m, and the average diameter at breast height (DBH) ranged from 10.0 cm to 30.0 cm. In intercropping, the highest yield was recorded in cluster bean (580 kg ha^{-1}), followed by cowpea (556 kg ha^{-1}) and green gram (460 kg ha^{-1}). In the sole cropping system, similar yield trends were observed for cluster bean, cowpea, and green gram, with yields of 590 kg ha^{-1}, 570 kg ha^{-1}, and 470 kg ha^{-1}, respectively.

Intercropping of rainfed *Kharif* crops in *Prosopis cineraria*-based agri-silviculture system

Under rainfed conditions, a 33-year-old *P. cineraria-based* agri-silviculture system showed higher yields for all *Kharif* crops compared to sole cropping. The highest increase was observed in cluster bean (23%), followed by pearl millet (21%) and cowpea (21%). Therefore, intercropping these *Kharif* crops in a *P. cineraria-based* agri-silviculture system under rainfed conditions is recommended.

Intercropping of rainfed Kharif crops in *Hardwickia binata*-based agri-silviculture system

In a 15-year-old *Hardwickia binata-based* agri-silviculture system under rainfed conditions, crop yields were observed to be lower (by 10-32%) compared to the sole cropping system, particularly without pruned trees. It is recommended that intercropping be conducted only for up to 15 years in this system, with a 5x5 m spacing.

SARDARKRUSHINAGAR- DANTIWADA AGRICULTURAL UNIVERSITY, SARDARKRUSHINAGAR

I) Tree germplasm collection, evaluation and improvement

In 2007, 46 tree species, fruit species, and shrubs were planted in a new arboretum under rainfed conditions in North Gujarat. By the end of 2023, only 33 species survived. The tallest plant was *Eucalyptus*, reaching a height of 16.97 m, while the highest collar diameter (50.48 cm) was recorded in *Ailanthus excelsa* (Ardusa). Among 10 plus tree progenies and 17 neem provenances, *SKN-7* exhibited the highest plant height (14.27 m) and a nimboli ranking of 80%. *SKN-4* had the largest collar diameter (51.27 cm) and the widest plant canopy (N-S: 11.50 m, E-W: 15.40 m) after 26 years.

However, *SKN-5* and *SKN-6* showed 100% mortality. Among the 17 neem provenances collected from various regions of Gujarat, the *Bharuch* provenance recorded the highest plant height (12.33 m), collar diameter (41.56 cm), and N-S plant canopy (9.25 m), while the *Vasda* provenance had the widest E-W plant canopy (9.90 m). The highest nimboli ranking (68%) was found in the *Godhra* provenance after 26 years.

Thirty neem progenies were tested, with Progeny No. 2 showing the highest plant height (11.65 m). No significant differences were observed in collar diameter among the progenies, but Progeny No. 28 had the largest collar diameter (32.25 cm). The highest nimboli ranking (82.00%) was recorded in Progeny No. 16, outperforming the others. Among 30 provenances of *Ailanthus excelsa*, genotype 18 (*Mithivavdi*) recorded the highest plant height (11.65 m) and collar diameter (30.41 cm). The lowest plant height (8.85 m) and collar diameter (20.12 cm) were found in genotype 24 (*Umiyanagar*).

Twelve genotypes of *Melia* were collected from different parts of Gujarat and planted during *Kharif* 2018. After five years, no significant differences were observed in plant height, collar diameter, or plant canopy among the genotypes. The highest plant height (10.00 m) was recorded in the local genotype, the largest collar diameter (20.70 cm) in *SDAUMD-11*, and the widest plant canopies (N-S: 5.23 m, E-W: 4.96 m) in *SDAUMD-2* and *SDAUMD-10*, respectively.

iii) System Research

The crop sequence of Greengram and Mustard recorded the highest grain yield (400 kg ha^{-1} and 460 kg ha^{-1}, respectively) and straw yield (760 kg ha^{-1} and 1610 kg ha^{-1}, respectively) in the middle part of the plot. In the boundary plantation of *Ailanthus excelsa* (Ardusa) and Neem, Ardusa showed the highest plant height (13.90 m) on the north side and the largest collar diameter (53.18 cm) on the south side. For Neem, the maximum plant height (11.60 m) and collar diameter (24.20 cm) were observed on the south side.

Among various medicinal plant species, the highest plant height was recorded under the Ardusa + Kalmegh treatment (57.80 cm), which was comparable to *Kalmegh* sole (53.83 cm). The highest Isabgol equivalent yield was obtained under the sole *Isabgol* treatment (14.58 kg ha^{-1}), which was on par with Ardusa + Isabgol (13.29 kg ha^{-1}). While there was no significant difference in Ardusa plant height, collar diameter, and plant canopy across different medicinal tree species intercropping treatments, the tallest Ardusa plants (4.92 m) were found under Ardusa + Kalmegh. The largest collar diameter (10.04 cm) and the widest plant canopy (N-S: 1.68 m, E-W: 1.76 m) were observed under Ardusa + Ashwagandha. Regarding the soil's physicochemical properties, no significant differences in pH, organic carbon (OC), P2O5, and K2O were noted at a 0-15 cm soil depth. However, the highest electrical conductivity (EC) at this depth was recorded under the Ardusa + Ashwagandha treatment compared to the other treatments.

In a study of a *Melia dubia* legume crop-based agri-silviculture system under North Gujarat conditions, the highest seed and straw yields (807 kg ha^{-1} and 2359 kg ha^{-1}, respectively) were recorded under the *Black gram sole* treatment (T_8), followed by *Melia* + *Black gram*. The maximum tree height (6.65 m) was observed under the *Melia* + *Clusterbean* treatment (T_5).

MAHATAMA PHULE KRISHI VIDYAPEETH, RAHURI

i) Diagnostic and Design

The center has collected and planted approximately 40 species of bamboo germplasm.

ii) Tree germplasm collection, evaluation and improvement

A total of 21 tree species were collected and planted, with Khaya grandiflora showing the highest plant height, collar diameter, DBH, and bole height.

Ten plus trees of neem were selected from the Rahuri region for their straightness of bole and planted for evaluation. The plus tree was selected from Khadamba Kh. village exhibited the highest height and collar diameter.

Among all the evaluated germplasm, Khaya grandiflora recorded the highest plant height (25.95 m), collar diameter (60.00 cm), DBH (49.04 cm), and bole height (12.10 m), followed by *Anogeissus latifolia, Acacia tortilis,* and *Terminalia bellirica,* which also showed promising growth characteristics.

The *Acacia nilotica* var. indica progeny from the RHRAN-1 provenance recorded the highest plant height (15.48 m), collar diameter (48.31 cm), DBH (42.98 cm), and bole height (4.91 m) at 22 years of age compared to other provenances.

The neem entry Sel-117 recorded the highest plant height (11.21 m), collar diameter (37.89 cm), and DBH (27.41 cm), while the entry Selection 105 had the highest bole height (4.95 m) among the various genotypes.

The *Acacia nilotica* provenance RHRAN-36 recorded the highest plant height (11.75 m), though it was at par with other entries. The RHRAN-57 entry showed the highest collar diameter (31.21 cm) and DBH (25.92 cm), while RHRAN-6 had the highest bole height (5.10 m) and RHRAN-41 recorded the highest number of branches (7.60)

In the tree improvement of *Pongamia pinnata*, after one and a half years of growth, significant differences were observed in plant height and collar diameter among the treatments. The entry RAK-10 recorded the highest plant height (1.47 m) and collar diameter (13 cm) among the tested entries.

iii) System Research

Agroforestry is recognized by over 140 countries as a key strategy to mitigate the adverse impacts of climate change, restore degraded soils, enhance livelihoods, and provide food, nutrition, energy, and increased income for farmers. India has been a pioneer in agroforestry research and development, with the implementation of the National Agroforestry Policy, a Sub-Mission on Agroforestry, and the National Bamboo Mission, reflecting the government's commitment to promoting agroforestry on a large scale. Agroforestry is a sustainable land management system that enhances land productivity by integrating crops, forest plants, and animals on the same land. This system combines trees, crops, grasses, and animals to optimize the production of food, fodder, fuelwood, timber, and other products, thereby improving financial returns. It also maximizes resource use by more efficiently capturing solar radiation and utilizing soil. Various tree-crop-grass combinations have been developed through the collective experience of farmers and researchers.

Mahatma Phule Krishi Vidyapeeth, covering 10 districts in Western Maharashtra, largely in arid and semi-arid areas, faces uncertain agricultural production due to erratic rainfall and moisture scarcity. In such regions, agroforestry can significantly enhance productivity in both cultivated and wasteland areas. Therefore, extensive research on agroforestry is essential. Since 1991, research at AICRP, MPKV, Rahuri has focused on several key objectives: surveying existing agroforestry systems across different agro-climatic zones, proposing viable systems to meet the needs for food, fodder, fuelwood, and timber, identifying suitable tree, crop, and grass species, developing production technologies, and studying soil health. Based on these objectives, research has led to the recommendation of an agri-horticulture system for irrigated areas, involving the planting of custard apples (5m spacing) between mango trees (10m x 10m) and intercrops of soybean in the *kharif* season and chickpea in the *rabi* season. This system, tested over seven years, was approved in the 2004 Agresco meeting. Additionally, a study on agri-silviculture, focusing on the impact of planting geometry on teak productivity in semi-arid conditions, is currently underway.

Dr. PANJABRAO DESHMUKH KRISHI VIDYAPEETH, COA, NAGPUR

I) Diagnostic and Design

A survey was conducted in Yavatmal, Maharashtra. The total geographical area of Yavatmal is 1,358,200 hectares, with approximately 950,000 hectares of cultivable land. The district has 19.21% forest land, and only 8% of the land

is irrigated. The average annual rainfall is 911 mm, and the population is 2,458,271. Major field crops include cotton, soybean, sorghum, and pigeon pea in the *Kharif* season and wheat, sorghum, and chickpea in the *Rabi* season. Key orchard crops are lemon, sweet lemon, oranges, and mangoes.

The traditional agroforestry systems in the region are:

Agri-silviculture: Bund plantations with crops like cotton, sorghum, or pigeon pea.

Agri-horticulture: Bund plantations of fruit trees are common, with major tree species on farms including *Tectona grandis* (teak), *Acacia nilotica*, *Albizia*, neem (*Azadirachta indica*), eucalyptus, bamboo, palash (*Butea monosperma*), ber (*Ziziphus mauritiana*), and mango (*Mangifera indica*). Forest-based industries in Yavatmal significantly contribute to the district's economy through the collection of Bibba, acacia gum, neem seeds, and bamboo. Minor and cottage industries include sawmills, production of household items and furniture, plywood manufacturing, and the collection of minor forest produce and tree fodder. Various forest development programs are actively implemented in the district, including the Social Forestry Program; tree plantations supported by MGNREGA, NHM, PoCRA, and RKVY; the Agroforestry Sub-Mission Tree Plantation Program; and the Atal Bamboo Samrudhi Yojana.

ii) Tree germplasm collection, evaluation and improvement

Tectona grandis

A total of seven germplasm varieties—PDKV/AF/1, PDKV/AF/2, SR1, and 4 Local have been collected. During a special excursion last year, 28 samples were gathered from virgin teak forests located in the Sironcha, Allappalli, Gadchiroli, and Chandrapur forest divisions in Eastern Vidarbha, Maharashtra. The seed sources include clonal seed orchards, TSO, and SPA, with 10 grafts prepared for each clone.

Bamboo

A diverse germplasm collection comprising 23 species has been gathered from various regions across India. The seed source for this collection is a clonal nursery in Tripura, with 10 cuttings or saplings prepared for each species.

List of species collected: *Dendrocalamus strictus*, *Bambusa vulgaris* (yellow), *Bambusa multiplex*, *Dendrocalamus stocksii*, *Bambusa tulda*, *Bambusa nutan*, *Bambusa balcooa*, *Bambusa brandicee*, *Bambusa bamboose*, *Dendrocalamus asper*, *Schizostachyum dulloa*, *Oxytenanthera parvifolia*, *Bambusa pallida*, *Thyrsostachys olivery*, *Dendrocalamus longipathus*, *Bambusa vulgaris* (green), *Dendrocalamus hamiltonii*, *Bambusa polymorpha*, *G. atrovoilacea*, *Bambusa cacherensis*, *Melocanna baccifera*, *Dendrocalamus latiflorus* and *Dendrocalamus giganteus.*

iii) System Research

Study on Growth and Productivity of Commercial Bamboo Species under Agri-Silviculture System

This experiment, initiated in 2022, aimed to evaluate the growth, morphology, and biomass production of bamboo species under an agri-silviculture system, assess the growth and yield of intercrops in bamboo-based agroforestry, and examine the system's impact on soil fertility. The study, conducted in a randomized block design (RBD) with three replications and a 7 x 2 m spacing, included eight bamboo species intercropped with turmeric (Waigaon variety).

The findings revealed that among the bamboo species:

Dendrocalamus stocksii exhibited the highest culm height (6.50 m), the maximum number of new culms per clump (9.33), and the total number of culms per clump (19.33).

Bambusa balcooa recorded the largest culm collar diameter (46.67 mm).

***Bambusa vulgaris* (green)** showed the greatest 5th node diameter (34.67 mm) and longest internode distance (23.67 cm).

In terms of turmeric performance

The highest weight of mother rhizome per plant (190 g) was recorded in the *Bambusa vulgaris* (green) + turmeric system, followed by *Bambusa tulda* + turmeric (171 g) and sole turmeric (170.67 g). Sole turmeric achieved the highest weight of finger rhizome per plant (50.30 g), total rhizome weight per plant (221.67 g), and rhizome yield (357.50 q ha^{-1}).

Utilization of Post-Harvest Bamboo Waste Biomass for Energy Pellet Production Using Various Binders

This experiment, conducted during 2023–24, aimed to identify suitable binding agents for pellet preparation, add value to bamboo biomass waste and evaluate the gross calorific value (GCV) and combustion properties of different pellets. The study employed 18 treatments, combining six binders with the post-harvest biomass of three bamboo species: *Bambusa balcooa*, *Dendrocalamus*

strictus, and *Dendrocalamus stocksii*, in a Factorial Randomized Block Design with three replications. The binders used were deoiled cakes (DOC) of Sal, Karanj, Mahua, Rice bran, and combinations of Mahua with Sal, Karanj, or Rice bran. Energy pellets (1 kg per replication) were prepared using bamboo dust and natural binders, with mixing ratios of 1000g bamboo dust to 100g binder for single binders, and 1000g bamboo dust to 50g each of two binders for combinations. The results demonstrated that incorporating natural binders significantly enhanced the quality of the energy pellets. This approach facilitated value addition and efficient utilization of bamboo post-harvest waste (30–40% of total harvest). The physical and combustion properties of the pellets, including GCV, were also improved, underscoring the potential of this method for sustainable biomass management.

Effect of Organic and Inorganic Additives on Composting of Incense Bamboo Waste

An experiment conducted during 2023–24 aimed to evaluate the impact of organic and inorganic additives on the decomposition of incense bamboo waste and assess the quality of compost produced. Using a Randomized Block Design (RBD) with three replications, 48" × 36" composting bags were employed, with 20 kg of bamboo waste per treatment. Additives included organic inputs (cow dung and poultry manure), biological agents (lignolytic fungi), and mineral additives (nitrogen in the form of urea). Fourteen treatments were tested, including combinations of bamboo waste with varying amounts of cow dung, poultry manure, nitrogen, and lignolytic fungi. Among the treatments, T_{14} (20 kg bamboo waste + 5 kg cow dung + 2.5 kg poultry manure + 0.2 kg lignolytic fungi) produced the best results, showing higher macro and micronutrient levels, the lowest C:N ratio (17.34), optimal physicochemical properties (pH, EC, bulk density, and color), maximum reduction in moist weight, and minimal lignocellulose content. This combination of organic and biological additives proved most effective in enhancing the decomposition process and producing high-quality compost with desirable nutrient and physical properties.

JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA, JABALPUR

i) Tree germplasm collection, evaluation and improvement

Evaluation of *Dalbergia sissoo* Provenances

Seeds from five Candidate Plus Trees (CPTs) were collected from Raipur, Dindori, Samastipur (Bihar), Jabalpur, Nagpur, and Faizabad. Additionally, seedlings of two Plus Trees (PT_6 and PT_2) were obtained from CAFRI, Jhansi. The seedlings were raised and planted in the field following a Randomized Block Design (RBD).

At 13½ years of age, the provenance sourced from NRC Jhansi (T_7) demonstrated superior growth, recording the highest plant height (1070 cm), collar diameter (237 mm), and diameter at breast height (dbh) (191 mm), outperforming all other provenances.

Consequently, progenies of *Dalbergia sissoo* from T_7 (PT_2) and T_6 (PT_6) from CAFRI, Jhansi, appear to be the most promising. In contrast, the provenance from RAU Pusa exhibited the lowest plant height (798 cm), collar diameter (168 mm), and dbh (132 mm).

Evaluation of *Dalbergia latifolia* Provenances

Seeds from 32 provenances were collected from eight states: Madhya Pradesh [TFRI (5), Mandla (3), and Tamia (3)], Chhattisgarh (8), Maharashtra (5), Jharkhand (3), Bihar (2), and West Bengal (3). The seedlings were raised and planted in the field under an RBD with three replications, in collaboration with TFRI, Jabalpur.

At 1½ years of age, the germplasm from TFRI, Madhya Pradesh (T_1), recorded the highest plant height (34.75 cm) and collar diameter (5.19 mm). In contrast, the germplasm from Tikaria, Mandla, Madhya Pradesh (T_4), exhibited the lowest plant height (24.11 cm) and collar diameter (3.57 mm).

ii) System Research

Dalbergia sissoo-Based Horti-Silviculture System

***Dalbergia sissoo* + Marigold**

Marigold grown under open conditions produced the highest flower yield, reaching 134.3 q ha^{-1}. Among the pruned treatments, 75% pruning resulted in a significantly higher flower yield of 127.9 q ha^{-1}, compared to 50% and 25% pruning. The lowest yield of 113.7 q ha^{-1} was recorded with no pruning. Open conditions also provided the highest net returns of ₹189,852 ha^{-1} with a B:C ratio of 3.40, followed closely by the 75% pruning treatment, which generated ₹176,900 ha^{-1} and a B:C ratio of 3.25. For nutrient management, green manuring combined with enriched vermicompost (2 t ha^{-1}) resulted in the highest flower production of 137.9 q ha^{-1}, while enriched vermicompost alone produced 127.9 q ha^{-1}, outperforming the 100% RDF treatment. Green manuring combined with enriched vermicompost also proved the most profitable, yielding ₹191,067 ha^{-1} with a B:C ratio of 3.25.

***Dalbergia sissoo* + Coriander**

The highest herbage yield of 6.05 g plant^{-1} and 2015.80 kg ha^{-1} was observed under open conditions. Green leaf yield reached its peak at 2453.30 kg ha^{-1} with green manuring followed by the application of enriched vermicompost (2 t ha^{-1}), which was comparable to treatments involving green manuring plus normal vermicompost (2 t ha^{-1}) and enriched vermicompost alone. Open-field cultivation of coriander under conventional conditions resulted in the highest net returns of ₹51,900 ha^{-1}, with a B:C ratio of 2.53. The combination of green manuring and enriched vermicompost (F5) yielded the highest profits at ₹ 65,600 ha^{-1}, with a B:C ratio of 2.74, followed closely by enriched vermicompost alone, which generated ₹ 55,000 ha^{-1} and a B:C ratio of 2.53.

Performance of Linseed Varieties with Sulphur Under Mango Plantation

The linseed variety JLS-73 outperformed the others with seed and straw yields of 12.89 q ha^{-1} and 33.19 q ha^{-1}, respectively, achieving a harvest index of 27.94%. JLS-66 followed with seed and straw yields of 11.04 q ha^{-1}and 28.42 q ha^{-1}, while the lowest yields (8.41 q ha^{-1}and 21.91 q ha^{-1}) were recorded for JLS-9. Sulphur application at 40 kg ha^{-1} resulted in the highest seed and straw yields of 11.80 q ha^{-1} and 29.74 q ha^{-1}, with a harvest index of 28.27%, outperforming both the 20 kg ha^{-1} treatment and the control. The control plot showed the lowest seed and straw yields of 9.60 q ha^{-1} and 25.45 q ha^{-1}, respectively. Sulphur application at 40 kg ha^{-1} also provided the highest net monetary returns of ₹45,870 ha^{-1} with a B:C ratio of 3.33, closely followed by the 20 kg/ha treatment, which yielded ₹42,862 ha^{-1}.

Soybean Varieties with Sowing Methods Under Mango Plantation

Raised bed planting outperformed the ridge-and-furrow and line sowing methods, achieving seed and straw yields of 1102.40 kg ha^{-1} and 2909.3 kg ha^{-1}, respectively. Among the soybean varieties, JS 20-116 excelled over JS-2069, with seed and straw yields of 1036.3 kg ha^{-1} and 2736.66 kg ha^{-1}. Sowing JS 20-116 on raised beds resulted in net returns of ₹32,168 with a B:C ratio of 3.08..

***Gmelina arborea*-Based Agri-Silviculture System**

The green gram–mustard rotation achieved higher arhar equivalent yields (1538.2 kg ha^{-1}) and net monetary returns (₹72,146 ha^{-1}) compared to sole arhar (1016.7 kg ha^{-1} and ₹48,001 ha^{-1}). Over a span of seven years, the Gmelina-based agroforestry system enhanced soil organic carbon content to 0.76% and 0.80% in the arhar–fallow and green gram–mustard rotations, respectively, from an initial level of 0.46%. Additionally, the system improved nutrient availability, increasing nitrogen (272–275 kg N ha^{-1}), phosphorus (12.5–12.9 kg P_2O_5 ha^{-1}), and potassium (326–330 kg K_2O ha^{-1}), compared to the initial levels of 198 kg N ha^{-1}, 11.2 kg P_2O_5 ha^{-1}, and 318 kg K_2O ha^{-1}.

Dalbergia sissoo +Marigold with (INM)

Dalbergia sissoo + Coriander with INM

Mango+ Soybean varieties under sowing methods

Mangifera indica+ linseed varieties with sulphur application

Gmelina arborea+ Greengram-Mustard

Gmelina arborea + Cowpea-Mustard

PROFESSOR JAYASHANKAR TELANGANA STATE AGRICULTURAL UNIVERSITY, HYDERABAD

i) Diagnostic and Design

A D&D survey conducted across various mandals in Bhadradri Kothagudem, Hanmakonda, Mulugu, Siddipet, and Karimnagar districts highlighted diverse agroforestry practices. In Bhadradri Kothagudem, Eucalyptus and Subabul block plantations were prevalent, with Eucalyptus-based agroforestry systems featuring cotton and maize as intercrops during the initial two years, followed by pulses, vegetables, and fodder crops in the 3rd and 4th years. The area under oil palm-based agroforestry systems, intercropped with cotton, chilies, maize, and groundnut, is expanding. In other districts, Teak-based agroforestry systems integrated with maize, cotton, paddy, and chilies were common, along with Eucalyptus and Malabar Neem block plantations. Additionally, mango and sweet orange-based agri-horti systems intercropped with cotton, maize, green gram, pastures, and vegetables were observed, with emerging Mahogany-based silvi-olericulture systems indicating growing diversification.

ii) Tree germplasm collection, evaluation and improvement

Neem Germplasm: Neem, a multipurpose tree species, has been a focus for tree improvement at this center, with 38 germplasm lines collected between 2000 and 2004, planted in three sets:

Set-I (Planted in 2000): After 23 years, line L-28 achieved the tallest height of 14.0 m, while L-42 recorded the largest girth of 83.4 cm, outperforming other lines.

Set-II (Planted in 2002): Among 12 germplasm entries, L-15 exhibited the highest mean height of 13.0 m and mean girth of 97.2 cm, followed by L-1 with a height of 9.4 m and girth of 86.2 cm.

Set-III (Planted in 2004): Eleven germplasm lines from the All India Coordinated Research Project on Agroforestry (Jhansi, U.P.) were tested as a multi-location trial. L-101 displayed the highest mean height (9.5 m) and girth (75.1 cm), followed by L-105 (8.6 m and 68.8 cm).

Pongamia Germplasm: Pongamia entries exhibited significant variability in tree height and diameter at breast height. SRJ-44 recorded the tallest height (9.7 m), followed by SRJ-45 (9.6 m). For mean girth, SRJ-39 led with 95.1 cm, closely followed by SRJ-38 at 94.5 cm.

***Melia dubia* Clones:** Between two clones, MTP-5 achieved the highest mean height of 13.3 m, while MTP-1 recorded the largest mean girth of 71.4 cm.

iii) System Research

Integrated Nutrient Management (INM) in Custard Apple-Based Horti-Pastoral System

The four-year pooled data (2020-21 to 2023-24) from the experiment on "Integrated Nutrient Management (INM) of different fodder crops in custard apple-based horti-pastoral system" revealed that *Panicum maximum* produced significantly higher herbage (21.1 t ha^{1} and dry fodder yields (5.49 t ha^{-1} compared to *Cenchrus ciliaris* (14.7 t ha^{-1} and 3.77 t ha^{-1}). Among various nutrient management practices, applying 75% Recommended Dose of Nutrients (RDN) + 25% Nitrogen through *Pongamia* green leaf manuring (PGLM) yielded significantly higher herbage (20.0 t ha^{-1}) and dry fodder (5.2 t ha^{-1}) compared to other treatments like 75% RDN + 25% nitrogen through *Subabul*, *Neem*, poultry manure, or FYM, and 100% RDF (60:60:40 kg NP_2O_5 K_2O ha^{-1}). The system net returns were highest (Rs. 76,342 ha^{-1} with these practices, while the highest B:C ratio (2.3) was recorded with 100% RDF. The adoption of INM also improved soil organic carbon from 0.6 to 0.72 over four years, compared to the use of 100% RDF with inorganic fertilizers alone.

Response of Fodder Grasses in Melia dubia-Based Silvi-Pastoral System

In the trial on "Response of different fodder grasses grown under Melia dubia-based Silvi-pastoral system" during 2023-24, the growth and carbon sequestration potential of *Melia dubia* were not significantly impacted by intercropping with various fodder grasses. The performance of fodder crops were ranked as follows: CO-5 > Guinea grass > CO-4 > APBN-1 > Anjan grass > Multicut sorghum > Marvel grass. Yield reductions due to intercropping with *Melia dubia* ranged from 5% (Guinea grass) to 22% (Marvel grass), with net returns decreasing by 10% in Guinea grass and 65% in Marvel grass. Soil nutrient availability (nitrogen, phosphorus, potassium) was higher in intercropped conditions, likely due to the addition of tree leaf litter.

Performance of Commercial Crops in *Melia dubia*-Based Agri-Silvi System on Marginal Lands

The experiment on Performance of different commercial crops in marginal lands of Melia dubia-based Agri-silvi system conducted during 2023-24 showed that the growth and carbon sequestration potential of *Melia dubia* were not significantly affected by intercropping. Yield reductions in intercrops compared to their sole crops were 3% in coriander, 7% in tulasi, 8% in lemon grass, citronella, and aloe vera. The performance of intercrops was ranked as: Aloe vera > Coriander > Lemon grass > Tulasi > Citronella. Soil nutrient availability (nitrogen, phosphorus, potassium) was relatively higher under intercropped conditions, likely due to the leaf litter provided by the tree.

DR. BALA SAHEB KONKAN KRISHI VIDYAPEETH, DAPOLI

i) Diagnostic and Design

A Diagnosis and Design (D & D) survey was conducted in Divan Khavati village, located in the Khed Tahsil of Ratnagiri District, where farmers have adopted various agroforestry systems, including homestead gardening, Terminalia tomentosa plantations on rice bunds, teak, mango, coconut, and cashew-based agroforestry systems. The agroforestry practices in the village include homestead gardening and nursery management, Terminalia tomentosa and Gmelina arborea bunds plantation on paddy fields, mango-based horti-agricultural systems, cashew-based horti-agricultural systems, and coconut-based agroforestry systems. However, farmers face several challenges, such as a lack of technical knowledge and skills regarding agroforestry practices, the absence of government policies on agroforestry, and a shortage of labor in the village.

ii) Tree Germplasm collection, evaluation and improvement

The tree germplasm collection, evaluation, and improvement efforts have focused on the conservation of various species, including *Tectona grandis, Acacia mangium, Acacia auriculiformis, Acacia holosericea, Gliricidia sepium, Casuarina equisetifolia, Albizia lebbeck, Pterocarpus marsupium, Bamboo species, Dalbergia sissoo, Dalbergia latifolia* (Shisham), *Morus alba* (Mulberry), *Melia dubia, Gmelina arborea, Garcinia indica, Mellittia pinnata, Santalum album, Anacardium*

iii) System Research

Development of *Dendrocalamus stocksii* Munro-based agroforestry practices for tropical humid regions (June 2017)

The highest bamboo growth was observed in the turmeric + bamboo-based agroforestry system at a spacing of 8 x 8 m in the Konkan region of Maharashtra.

Development of Asana-based horticultural systems in Konkan (June 2016)

Among the Asana-based agroforestry systems, the combination of Asana + Mulberry recorded the highest biomass yield.

Effect of organic manures and inorganic fertilizers on soil properties and growth of sandal in lateritic soil (June 2016)

The application of 125% RDF along with vermicompost at 3 $^{kg\text{-}1}$ tree significantly improved the growth performance of sandal and soil properties compared to 100% RDF and the absolute control.

TAMIL NADU AGRICULTURAL UNIVERSITY, FCRI, METTUPALAYAM

I) Diagnostic and Design

A reconnaissance survey was conducted in the villages of Tholampalayam, Jadayampalayam, Nellithurai, Thekkampatti, Illupanatham, and Velliyankadu, located in Mettupalayam Taluk, Coimbatore district, in the Western Ghats of Tamil Nadu. Teak plantations were the predominant agroforestry practice in Nellithurai and Thekkampatti villages, while bund planting was observed in Illupanatham and Velliyankadu villages. Additionally, scattered and linear plantations of *Swietenia macrophylla* and *Ceiba pentandra* were noted. Horti-silvicultural practices, such as Melia intercropped with curry leaf, were also found in Tholampalayam and Jadayampalayam. A shelterbelt and windbreak system were observed in the Karamadai block of Mettupalayam.

ii) Tree Germplasm collection, evaluation and improvement

Assemblage of Germplasm in *Ceiba pentandra*

In Southern Tamil Nadu, candidate plus trees (CPTs) of Kapok (*Ceiba pentandra*) were identified from various Kapok-growing regions. Progenies were raised from the propagules collected from these selected CPTs. A trial was conducted at the farmer's field in Samanaickenpalayam, Veerapandipirivu Taluk, Coimbatore district, involving 23 progenies and two clones of Kapok. Growth parameters were recorded at 36 months after planting. Among the progenies, the highest tree height was observed in MTPCPP18 Varasanadu (3.01 m), while the maximum diameter at breast height (DBH) was found in MTPCPP2 Vathalakundu (16.20 cm). The minimum height was recorded in MTPCPP11 Periyakulam (1.63 m), and the lowest DBH was observed in MTPCPP9 Bodi (3.89 cm). Among the 25 genetic resources studied, MTPCPP2 (Vathalakundu) exhibited the highest values for pod characteristics, including the number of pods per tree (64), pod length (32.40 cm), pod width (4.47 cm), green pod weight (56.50 g), floss weight with seed per pod (28.90 g), and floss weight with seed (628.86 kg ha^{-1}). The progenies from Bodi showed inferior pod characteristics compared to the others. In Periyakulam, Vathalakundu CPT 2 exhibited the maximum height (6.10 m), while Sempatty CPT 1 showed the minimum height (3.50 m). Varasanadu CPT 23 performed the best among the CPTs.

Assemblage of Germplasm in *Melia dubia*

A trial involving five clones/progenies of Melia dubia, namely Melia MTP 1, Melia MTP 2, Pre-released culture MTP-3, Pre-released culture MTP-4, and MD 44, was conducted at a farmer's field in Theramplayam, Mettupalayam. Biometric observations were recorded at 42 and 48 months after planting (MAP).

Among the five genetic resources, Melia MTP-2 showed the highest growth in terms of height, basal diameter, and volume at both 42 and 48 MAP. At 42 months, the maximum height (21.54 m), DBH (40.95 cm), and volume (1.854 m^3) were recorded for Melia MTP-2, while the lowest values were observed in Melia MTP-1 with a height of 13.79 m, DBH of 30.14 cm, and volume of 0.623 m^3. At 48 months, Melia MTP-2 recorded the maximum height (22.66 m), DBH (447.86 cm), and volume (2.641 m^3), whereas the lowest values were again observed in Melia MTP-1 with a height of 15.03 m, DBH of 36.35 cm, and volume of 1.013 m^3. Overall, Melia MTP-2 outperformed the other germplasm in terms of growth at both 42 and 48 MAP.

iii) System Research

Kapok-Based Agroforestry System

In a Kapok-based agroforestry system, intercropping of finger millet (Paiyur 1) and blackgram (VBN8 & VBN11) varieties was carried out under a 3-year-old *Ceiba pentandra* plantation at a farmer's field in Samanaickenpalayam, Coimbatore district. The experiment aimed to evaluate finger millet and blackgram as intercrops under *Ceiba pentandra*, to develop a novel agroforestry model. Among

the various treatments, the combination of *Ceiba pentandra* + Blackgram (VBN11) showed the highest bulk density (1.16 g cm^{-3}). The maximum soil porosity was recorded in *Ceiba pentandra* alone (16.55%). *Ceiba pentandra* + Blackgram VBN11 also exhibited the highest soil pH (7.89), EC (0.17 dS m^{-1}), and nutrient content, with available N (168.2 kg ha^{-1}), available P (14.60 kg ha^{-1}), and available K (154.20 kg ha^{-1}). Growth of intercrops, including finger millet and blackgram varieties, showed significant differences in plant height at various growth stages (30 DAS, 60 DAS, and harvest). At harvest, the plant height was recorded as 35.3 cm for blackgram VBN8, 35.6 cm for blackgram VBN11, and 68.2 cm for finger millet Paiyur1. In comparison, pure crops recorded heights of 37.0 cm (blackgram VBN8), 38.5 cm (blackgram VBN11), and 70.43 cm (finger millet Paiyur1). The highest yield was obtained from finger millet Paiyur1 (3025 kg ha^{-1}), while the lowest was 2895 kg $ha^{-1}$for finger millet under open field conditions.

Pulpwood-Based Agroforestry System

This study assessed the provision of provisional, regulating, cultural, and supporting ecosystem services in a pulpwood-based agroforestry system. The trial included eight pulpwood tree species alongside various agricultural crops. *Neolamarckia cadamba* and *Melia dubia* showed the highest volume and biomass, with *Neolamarckia cadamba* recording the greatest biomass (37 kg $tree^{-1}$) and carbon stock (19.97 kg $tree^{-1}$*). Casuarina junghuhniana*, from 196 trees, demonstrated the highest overall biomass and carbon stock. The total carbon sequestered by pulpwood trees and soil in the pulpwood-based agroforestry system was 1.25 tons and 34.10 Mg ha^{-1} respectively. Cultural services were evaluated through qualitative surveys and workshops, which revealed that the change in cultural ecosystem service value correlated with the socio-demographic profile of participants. The most valued cultural service was spending quality time (0.91), followed by education and scientific knowledge (0.89). The results suggest that pulpwood-based agroforestry is highly beneficial for small landholding farmers, providing significant economic benefits alongside regulating, cultural, and supporting services.

Dendroenergy-Based Agroforestry System

A new experiment was established at a farmer's field in Jadyampalayam, Coimbatore district, to explore the potential of a Dendroenergy-based Agroforestry model. The field trial was laid out in a randomized block design (RBD) with ten treatments and three replications, with clones planted at a spacing of 1.5 m × 1.5 m. The highest water content was recorded in the Acacia hybrid (80.34%), along with the maximum photosynthesis rate (4.98 mg g^{-1}) and total chlorophyll content (7.4 µmol$m^{-2}sec^{-1}$). The highest transpiration rate was observed in *Dalbergia sissoo* DS-07 (1.22 mmol$m^{-2}sec^{-1}$), while the lowest was recorded in *Casuarina equisetifolia* (CE-16) (0.89 mmol$m^{-2}sec^{-1}$). After 3 months of planting (MAP), biometric data of the ten clones were recorded. Acacia hybrid (AM09) showed the maximum height (78.50 cm) and diameter (11.32 mm), while the lowest height and diameter were recorded in Terminalia bellirica (FCRITB13) with 45.32 cm and 4.15 mm, respectively.

***Melia Dubia*-Based Agroforestry System**

An experiment was established at Jadayampalayam farmer's field to study the performance of four annual crops—Groundnut (CO-7), Black gram (VBN-2), Cowpea (CO-7), and Green gram (CO-9)—under a *Melia dubia*-based agroforestry system. The field trial was laid out in a randomized block design (RBD) with a spacing of 3 x 3 m under irrigated conditions. Sowing was completed under six-month-old *Melia dubia* trees.

TAMIL NADU VETERINARY AND ANIMAL SCIENCES UNIVERSITY, IAN, KATTUPAKKAM

I) System research

In a *Cocos nucifera*-based hortipasture and open system, the application of nano urea as a top dressing at 4 ml $litre^{-1}$ showed no significant ($P > 0.05$) differences in plant height, number of tillers, number of leaves, leaf length, and biomass yield during the first four harvests. However, at the fifth harvest, the application of nano urea at 4 ml $litre^{-1}$ was found to be insufficient, leading to a significant

($P < 0.05$) reduction in growth and yield compared to urea super granules. In both open and understorey systems, yield reductions were 9.03% and 8.5%, respectively. To address the mild yellowing of Panicum maximum leaves, higher doses of nano urea at 6 ml litre^{-1} and 8 ml litre^{-1} were tested, resulting in significantly higher biomass yield. The treatment is being continued for subsequent harvests.

In the understorey of *Manilkara zapota* with *Desmanthus virgatus*, applying nano urea at 4 ml litre^{-1} as a top dressing for the first five harvests resulted in no significant ($P < 0.05$) difference in yield compared to urea super granules. The yield of the fodder crop during the first five harvests was 77.4 t ha^{-1} for the control and 78.2 t ha^{-1} for the treatment group.

Setaria italica and *Panicum sumatrense* showed the best biomass yield under 25% shade in a guava-based hortipasture system. In a multitier system with *Vigna unguiculata* under *Leucaena leucocephala*, the application of nano urea at different doses (T_1: 0 ml litre^{-1}, T_2: 2 ml litre^{-1}, T_3: 3 ml litre^{-1}and T_4: 4 ml litre^{-1}) resulted in increased fodder biomass yield across all treatments, except the control (T_1). Crop yields were 11.2, 12.97, 13.01, and 13.09 t ha^{-1} for T_1, T_2, T_3, and T_4, respectively. Based on these results, the recommended dose of nano urea for Vigna unguiculata as a top dressing is 2 ml litre^{-1} (T_2).

Moringa oleifera leaves harvested from a multi-tier agroforestry model were dried and ground into leaf meal for inclusion in the concentrate feed of quails during the brooder, grower, and layer stages. Three groups were compared: a control group (C) and two experimental groups (T_1 and T_2) fed rations containing 2.0% and 4.0% Moringa leaf meal, respectively. Statistical analysis showed no significant difference ($P > 0.05$) in body weight between treatment groups at the end of the 5th week. Hen-day egg production from the 6th to 16th week increased by 0.66% in the 2% *Moringa oleifera* group (T_1) compared to the control. Both the 2% and 4% *Moringa oleifera* groups showed upregulated gene expression for iron-related enzymes, including catalase, cytochrome c oxidase, ferritin heavy chain, and succinate dehydrogenase.

Panicum maximum harvested from the hortipasture model was used to prepare Total Mixed Ration (TMR) silage at inclusion levels of 100%, 75%, and 50%, blended with maize, soybean meal, and de-oiled rice bran in specific proportions under anaerobic conditions. The TMR silage with 75% wilted green Panicum maximum, 12.5% ground maize, 6.25% soybean meal, and 6.25% de-oiled rice bran exhibited better fermentation attributes (light green color, pleasant aroma, pH 4.48) and higher palatability compared to TMR silage with 100% and 50% *Panicum maximum*. The Dietary Cationic and Anionic Difference (DCAD) value of the ration for four experimental Boer cross goats in the second partum was adjusted to -15.87 mEq 100g^{-1} dry matter through the supplementation of anionic salts (one gram of calcium sulfate and magnesium chloride). Before kidding, supplementation of anionic salts was provided for ten days alongside a feeding regimen of Bajra Napier hybrid grass (5 kg) and Leucaena leucocephala (0.5 kg), resulting in a reduction of urinary pH to 6.5 and a 10.32% increase in serum calcium levels.

UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD

I) Design and Diagnostic

In the year 2023-24, the center conducted a Design and Diagnostic (D & D) Survey in Uttar Kannada District, which falls under the university's jurisdiction. The survey focused on the agroforestry systems practiced by farmers in the district, located in the Central Western Ghats.

This table presents the percentage of farmers in different agroforestry systems and practices in Uttar Kannada, illustrating a diverse mix of traditional and innovative approaches to farming in the region.

ii) Tree Germplasm Collection, Evaluation and Improvement

The center has established a Tamarind orchard using fourteen different germplasm collections of *Tamarindus indica*. Among these, several clones such as DTS-1, DTS-2, SMG-13, PKM-1, TKA-1, and NTI-79 were identified as potential candidates for mass multiplication. The center is actively working on producing high-quality planting materials from these improved tamarind clones for the benefit of the farming community. A collection of twenty *Azadirachta indica* provenances has been gathered from various regions. Four provenances, in particular, demonstrated better growth and suitability for progeny trials in the northern transitional zone. Among these, the Bijapur and Raichur provenances outperformed the others

Agroforestry Systems Practiced by Farmers in Uttar Kannada District:

S.No	Agroforestry System	Practice	West Coast (%)	Sahyadri Interior (%)	Eastern Plains (%)	Total (%)
1	Agri-Silviculture System	Bund planting	12.22	6.94	38.89	15.15
		Boundary planting	38.89	22.22	47.22	34.34
		Block plantation	24.44	23.61	50.00	28.79
		Scattered trees	3.33	-	58.33	12.12
		Plantation crop combination	95.56	100.00	16.67	82.83
		Homegarden	8.89	1.39	-	4.55
2	Silvi-Pastoral System	Bena/Betta land	12.22	29.17	-	16.16
3	Agri-Silvi-Pastoral System	Homegarden (with livestock)	61.11	76.39	-	55.56
		Permaculture	-	-	2.78	0.51
4	Other Systems	Apiculture	10.00	20.83	-	12.12
		Aquaculture	1.11	2.78	-	1.52
		Hydroponics	2.22	-	-	1.01

and have been recommended for inclusion in agroforestry systems, particularly for bund planting at wider spacings.

Eleven provenances of *Pongamia pinnata* were collected and evaluated for performance. The MTP-I provenance showed significantly higher growth, with a height of 9.4 m and a tree volume of 0.087 m^3, compared to the other provenances. The highest seed yield was recorded in RAK-22 (4.90 kg $tree^{-1}$) and MTP-II (4.00 kg $tree^{-1}$). Seven sources of *Carissa carandas* were evaluated, with the Tumakur source recording the highest height (2.12 m) and collar diameter (39.10 cm), followed by Arabhavi with a height of 1.72 m and collar diameter of 33.00 cm, outperforming other sources. Among nine thornless bamboo species collected and evaluated, *Bambusa balcoa* from Sindhudurg (7.57 m) achieved the maximum height, followed closely by *Dendrocalamus stocksii* from Dapoli (7.22 m). The number of new culms was highest in *Dendrocalamus stocksii* from Dapoli (30.8 culms) and IWST, Bangalore (29.2 culms). The longest internodal length was observed in the Ponnampet provenance (13.99 cm). Eleven rare, endangered, and threatened biofuel species, including *Aphanomixis polystachya*, *Madhuca indica*, *Calophyllum inophyllum*, *Bakula*, *Surati*, *Saraca ashoka*, *Soapnut*, *Ujppange*, *Garcinia indica*, *Amura*, and *Kadugeru*, were collected from the Western Ghats and planted in the biofuel park at a spacing of 5 × 4 m. The center also collected 22 different provenances of *Soapnut*, raised seedlings in the nursery, and planted them at a spacing of 6 × 5 m during the 2022-23 planting season.

iii) System Research

Tamarind-based Agroforestry System

Among the fourteen tamarind collections evaluated during the year, NTI-5 (10.14 m) and NTI-80 (10.12 m) exhibited significantly superior growth compared to the other collections. The maximum trunk diameter was observed in NTI-14 (27.63 cm), followed by NTI-19 (27.21 cm) and NTI-77 (27.17 cm). The crown area was most prominent in NTI-14 (26.60 m^2 $tree^{-1}$), followed by NTI-79 (25.45 m^2 $tree^{-1}$). NTI-14 (12.5 kg $tree^{-1}$), NTI-19 (12.45 kg $tree^{-1}$), and SMG-13 (11.92 kg $tree^{-1}$) recorded the highest fruit yield compared to the other collections.

Sapota-Timber Species-based Agroforestry System

In a study on sapota-timber tree species-based agroforestry models, *Pterocarpus marsupium* exhibited significantly higher height and basal area (15.20 m and 0.158 m^2 $tree^{-1}$, respectively), followed by *Terminalia paniculata* (14.60 m and 0.102 m^2 $tree^{-1}$). The highest tree volume was recorded in *Pterocarpus marsupium* (1.21 m^3 $tree^{-1}$).

The growth of sapota was greater when grown alone (6.90 m). The height of sapota was significantly higher when associated with *Pterocarpus marsupium* (6.48 m), followed by *Lagerstroemia lanceolata* (6.20 m). The crown area was also significantly larger in sapota + *Pterocarpus marsupium* (40.60 m^2/tree) compared to sapota with other species. The highest fruit yield was observed in sapota grown alone (45.50 kg $tree^{-1}$) and in combination with *Lagerstroemia lanceolata* (27.82 kg $tree^{-1}$), which also enhanced the nutrient content in the system.

Soil Physical and Chemical Properties

Soil pH showed slight increases in agroforestry systems, with the highest pH recorded in sapota + *Tectona grandis*

(7.2 pH), followed by sapota + *P. marsupium* (7.1 pH) and sapota + *L. lanceolata* (7.1 pH). Electrical conductivity (EC) of soil decreased in sapota + *Pterocarpus marsupium* (0.38 dS m^{-1}) and sapota grown alone (0.42 dS m^{-1}). Available nutrients—nitrogen, phosphorus, and potassium—showed increases, with sapota + *Tectona grandis* showing the highest nitrogen content (247.40 kg ha^{-1}), followed by sapota + *L. lanceolata* (56.40 kg ha^{-1}), and sapota + *P. marsupium* (342.0 kg ha^{-1}). Organic carbon increased in sapota + *Tectona grandis* (7.30 g kg^{-1}), while available sulfur was highest in sapota + *Tectona grandis* (13.50 ppm) compared to initial soil levels. Water holding capacity was highest in sapota with *Lagerstroemia lanceolata* (64.10%) and sapota with *Terminalia paniculata* (63.80%) compared to other timber tree species.

Fodder Tree Species Under Agroforestry System

Among the seven fodder tree species evaluated, the highest collar diameter was recorded in *Gliricidia sepium* (14.25 cm), followed by *Calliandra calothyrsus* (14.10 cm). The number of branches per tree was significantly higher in *Calliandra calothyrsus* (38.95 branches $tree^{-1}$), followed by *Leucaena leucocephala* (37.35 branches $tree^{-1}$).

Lopping and topping were performed at 2 m height three times during the year. The green biomass was significantly higher in *Calliandra calothyrsus* (1434.00 kg ha^{-1}) and *Sesbania grandiflora* (1294.45 kg ha^{-1}) compared to other fodder species.

The green biomass was subsequently fed to sheep and goats to assess palatability. Dry matter analysis showed the lowest Neutral Detergent Fiber (NDF) content in *Moringa oleifera* (33.25%), followed by *Sesbania grandiflora* (33.85%) compared to other species. The lowest Acid Detergent Fiber (ADF) content was recorded in *Leucaena leucocephala* (14.95%) and *Sesbania grandiflora* (15.10%), while the lowest Acid Detergent Lignin (ADL) content was found in *Moringa oleifera* (8.21%).

UNIVERSITY OF AGRICULTURAL SCIENCES, BENGALURU

I) Tree germplasm Collection, Evaluation and improvement

Evaluation, Selection, and establishment of clonal seed orchard of Tamarind

Twenty-seven tamarind germplasms, sourced from various locations, were established in a Clonal Seed Orchard at GKVK between 2010 and 2012. After 13 years of growth, the germplasm NFN-10 attained the greatest plant height (8.2 m), closely followed by NFN-4 (8.16 m). NFN-1 exhibited the largest diameter at breast height (DBH) at 28.15 cm, with

NFN-10 recording 26.86 cm. In terms of canopy spread, NFN-3 achieved the widest dimensions in the N-S and E-W directions (9.3 m and 8.5 m, respectively), followed by NFN-4 (9.3 m and 8.1 m, respectively). NFN-6 recorded the highest yield among all germplasms. The germplasm GKVK-4 produced the heaviest fruits (34.14 g) with the highest pulp weight (15.28 g). NFN-10 also showed the highest wood volume (46.44 m^3 ha^{-1}), followed by NFN-1 (45.11 m^3 ha^{-1}). Carbon sequestration was maximized in NFN-10 (80.45 t ha^{-1}), with NFN-1 close behind at 78.14 t ha^{-1}.

ii) System Research

Evaluation of fodders under teak based Agroforestry system

After 13 years of teak planting, the tallest trees were observed in the 12 m × 3 m spacing (10.23 m), followed by 10 m × 3 m (10.04 m) and 8 m × 3 m (9.27 m) spacings. Similarly, the largest girth at breast height was recorded in the 12 m × 3 m spacing (57.16 cm), followed by 10 m × 3 m (52.94 cm) and 8 m × 3 m (49.75 cm). Canopy spread from the tree center ranged from 6.21 m (E-W) to 5.86 m, and 6.83 m (N-S) to 6.71 m. Narrower planting densities resulted in higher soil organic carbon content (1.51 t ha^{-1}). However, total biomass (28.55 t ha^{-1}), carbon content (13.42 t ha^{-1}), and carbon dioxide content (13.42 t ha^{-1}) were significantly higher in the 12 m × 3 m spacing. The 8 m × 3 m spacing showed greater soil organic carbon (0.56%), available nitrogen (251.47 t ha^{-1}), available phosphorus (19.44 t ha^{-1}), and available potassium (205.47 t ha^{-1}). Among grasses, Super Napier recorded the tallest plants (226.5 cm), while guinea grass excelled in tillers per clump (43.1) and leaf-to-stem ratio (1.16). Sole CO-5 performed best with the highest number of leaves per clump (352.7), leaf area per clump (49,037 cm^2), green fodder yield (86.53 t ha^{-1}), and dry fodder yield (19.71 t ha^{-1}). Among fodder intercrops, CO-5 recorded the highest fodder biomass yield (73.01 t ha^{-1}).

Sandal based agroforestry system

After four years of planting, sandalwood trees achieved the greatest height in the 5 m × 5 m spacing (2.74 m), followed by the 5 m × 4 m spacing (2.51 m). Among host plants, *Morus alba* supported the tallest sandalwood growth (3.12 m), with *Sesbania* coming next at 2.73 m. The largest collar girth was also observed in the 5 m × 5 m spacing (17.06 cm), followed by 5 m × 4 m (15.48 cm). Among hosts, *Sesbania* facilitated the highest collar girth (19.81 cm), followed by *Moringa* (18.62 cm). Canopy spread was widest in the 5 m × 5 m spacing, with measurements of 2.05 m (E-W) and 2.29 m (N-S). *Sesbania* as a host plant contributed to a broader canopy spread in sandalwood trees, measuring 2.55 m (E-W) and 2.79 m (N-S), compared to other hosts. For intercrops, cowpea performed well under the 5 m × 5 m spacing, yielding 1176 kg ha^{-1}, while the highest seed yield (1625 kg ha^{-1}) and haulm yield were recorded in sole cowpea cropping.

Spacing trial on Mahogany based agroforestry system

After 4 years of planting, the results showed that among different planting densities, the highest tree height was recorded in the 5 m × 5 m spacing (5.85 m), followed by 5 m × 4 m (5.45 m), with a similar trend observed for girth and DBH. However, the highest volume per hectare, total biomass, carbon content, and carbon dioxide were recorded in the 5 m × 3 m spacing, followed by the 5 m × 4 m spacing. In terms of intercrops, cowpea growth and yield (1092 kg ha^{-1}) were better under the 5 m × 5 m planting density compared to the other two spacings. The highest seed yield and haulm yield were recorded in the sole cowpea crop (1625 kg ha^{-1}).

KERALA AGRICULTURAL UNIVERSITY, THRISSUR

I) Design and Diagnostic

A survey and documentation of green leaf manuring practices among paddy farmers in the Ollukkara and Wadakkancheri blocks of Thrissur, Kerala, were conducted through questionnaire surveys and field visits. The study aimed to explore existing manuring practices, understand farmer preferences, and devise strategies to revive green leaf manuring. The findings revealed that over 15 tree species are used for green leaf manure, with most farmers (97.5%) sourcing these from forests. Commonly used species include *Terminalia* and *Mangifera indica.*

Currently, 40% of the farmers utilize green manures, primarily *Gliricidia sepium* and *Mangifera indica* (70%). These materials are predominantly obtained from home gardens (62.5%) and field boundaries (37.5%). Despite a

strong inclination towards sustainable soil management practices like green leaf manuring, challenges such as labor shortages, high costs, and transportation difficulties limit its widespread adoption. Encouragingly, approximately 80% of farmers expressed willingness to adopt green leaf manuring by planting green manure trees along unused bunds and boundaries.

ii) Tree Germplasm Collection, Evaluation and Improvement

This center maintains a diverse tree germplasm collection, including 10 provenances of *Acacia mangium* sourced from their natural habitats in Australia and Papua New Guinea, 30 teak accessions from South India, and 9 bamboo varieties. A 23-year teak provenance evaluation trial revealed superior growth performance among Nilambur provenances. Notably, trees from Cherupuzha exhibited the highest growth metrics, with a height of 15.33 m, a DBH of 0.209 m, and a volume of 0.407 m^3. Other high-performing provenances included Nedumkayam-2, Nellikutha-5, Nedumkayam-1, and Karulai. However, the overall teak growth in the experimental area was moderate, likely due to the presence of a shallow, hard lateritic pan at the site.

iii) System Research

Fodder Grass-Tree Mixture Systems in Smallholder Farms

Grass-tree mixture systems have demonstrated significant potential to address fodder and protein deficits in partially shaded smallholder dairy farms, offering higher forage yield and quality than grass monoculture systems. Among these, the Guinea (G) + Calliandra (C) system produced the highest cumulative dry forage yield over two years (90.18 Mg ha^{-1}), followed by Hybrid Napier (HN) + Calliandra (71.24 Mg ha^{-1}) and Guinea + Mulberry (69.89 Mg ha^{-1}). Crude protein content followed a similar trend, with values of 10.93, 8.79, and 7.82 Mg ha^{-1}, respectively.

The Land Equivalent Ratio (LER) was highest for G+C (1.43), followed by Guinea + Mulberry (1.16) and HN+C (1.09). The highest Benefit-Cost Ratios (BCR) were observed in HN (2.57) and G+C (1.97), with all systems proving profitable. Photosynthetically Active Radiation (PAR) transmission to understorey grasses ranged from 69.52% to 72.04%. Regression analysis showed higher sensitivity of HN to light availability (R^2 = 0.7092) compared to Guinea grass (R^2 = 0.6471), indicating that HN is more light-demanding.

Green Leaf Manuring Trees on Wetland Paddy Bunds

A trial assessing the growth and green biomass production of selected trees and shrubs on wetland paddy bunds highlighted *Sesbania grandiflora*, *Cajanus cajan* (Red gram), *Cassia siamea*, *Terminalia arjuna*, and *Gliricidia sepium* as excellent candidates for hedgerow planting due to their robust growth, productivity, and resilience. These trees were planted at a spacing of 1 m on internal bunds (50 cm wide) and managed as hedgerows, with green biomass harvested above a height of 1 m.

In the initial year, *Sesbania* produced 5.45 kg $plant^{-1}$ of green biomass, while Red gram yielded 4.10 kg $plant^{-1}$, followed by *Gliricidia* and *Arjuna*. When scaled up, approximately 2–2.5 t ha^{-1} $year^{-1}$ of green leaf biomass can be harvested from 500 plants (spaced at 20 m intervals in an east-west direction), providing around half of the recommended green manure requirements for paddy in Kerala.

Bamboo (*Dendrocalamus stocksii*) Based Agroforestry System

A bamboo-based agroforestry trial using *Dendrocalamus stocksii* under different spacings showed that most growth attributes plateaued by the sixth year. Wider spacing (8 × 8 m) resulted in improved growth parameters, except for culm height, which was highest at closer spacing (8 × 4 m) with a value of 9.55 m compared to 8.95 m at wider spacing.

Wider spacing (8 × 8 m) yielded the largest culm diameter (127.1 cm), maximum culms per clump (31), highest number of internodes per culm (36), and the longest internodal length (30.5 cm). Profitable intercrops such as Wild Turmeric (*Curcuma aromatica*) and Turmeric (*Curcuma longa*) thrived throughout the bamboo growth phase, with the 8 × 8 m spacing proving most favorable for both bamboo and intercrop productivity.

UNIVERSITY OF AGRICULTURAL AND HORTICULTURAL SCIENCES, COF, PONNAMPET

i) Design and Diagnostic

The survey conducted in the villages of Virajpet and Ponnampet, located in the Virajpet taluk of Kodagu district, Karnataka, revealed a strong preference among farmers for growing native fruit-bearing and commercial timber trees. Black rosewood (*Dalbergia latifolia*) was the most favored timber species, followed by Honne (*Pterocarpus marsupium*). The survey highlighted the significant

diversity of tree species in the home gardens, which serve as the primary agroforestry systems to meet the basic needs of families in the region. Species like *Persia americana*, *Manilkara zapota*, and *Artocarpus heterophylus* were found to be predominant in these home gardens. When comparing tree diversification across different land use practices in the hill zone, the study revealed that diversity indices—such as species richness, Shannon index, Simpson index, and species evenness — were notably higher in Virajpet compared to the Ponnampet region.

ii) Tree Germplasm Collection, Evaluation and Improvement

Collection and Evaluation of Bamboo Resources for Sustainable Utilization

After four years of planting, all bamboo species showed significant differences in growth parameters. Among the species tested, *Bambusa tulda* exhibited the best growth, with a clump height of 9.84 m, a clump diameter of 4.58 m, and an average of 10.23 culms, followed closely by *Bambusa nutans*. The least growth performance was observed in *Dendrocalamus asper* and *Guadua angustifolia*. This experiment is ongoing.

Germplasm Collection and Evaluation of Silver Oak and Mahogany

The center has initiated the germplasm collection and evaluation of two key timber-yielding tree species: *Grevillea robusta* (silver oak) and *Swietenia macrophylla* (mahogany). Seeds of mahogany have been collected, and 500 seedlings have been raised for distribution to farmers.

iii) System Research

Development of *Dendrocalamus stocksii* Munro-based Agroforestry Practice for Tropical Humid Regions

The growth performance of *Dendrocalamus stocksii* was evaluated under different spacing treatments, revealing significant differences in height growth, number of shoots per clump, and clump girth after six years of planting. Among the spacing regimes, treatment T_3 (8m × 8m) showed the best results, with clump height (9.86 m), clump girth (6.27 m), culm diameter (3.61 cm), and number of culms per clump (67.44) significantly higher than T_1 (8m × 4m) and T_4 (4m × 4m), though T_3 was on par with T_2 (8m × 6m). The closest spacing (4m × 4m, T_4) exhibited the lowest values. No intercrop activities were undertaken due to low rainfall during the season. This experiment is ongoing.

Development of Harvesting Methods for Litsea-Based Agroforestry Models

Litsea chinensis, an important plant for jigat production in the incense stick industry, is being studied for its potential in agroforestry models with the support of industry partners. A block plantation was established at MAHRS Iruvakki in 2020, and the plants are now three years old. Once the plants reach six years of age, an assessment of growth and the development of sustainable harvesting methods will be undertaken. This experiment is ongoing.

Assessment of Growth Performance of Teak Clones in Tropical Humid Regions

A clonal trial using 10 high-performing teak clones from the Institute of Forest Genetics and Tree Breeding in Coimbatore was established at MAHRS Iruvakki to identify the most suitable clone for the region. After 18 months of planting, teak clone TS 28-1 showed the best growth, with a height of 280.00 cm, followed by TS 20-2 at 226.66 cm. The lowest growth was observed in teak clone SIL (45.00 cm). No significant differences were observed in collar diameter among the different teak clones. This experiment is ongoing.

In a study on establishment and growth performance of *Santalum album,* the seedlings raised in the nursery and planted with seven fodder tree species *viz., Sesbania grandiflora, Gliricidia sepium, Moringa oleifera, Calliandra calothyrsus, Leucaena leucocephala, Albizia lebbeck, Bauhinia purpurea* as secondary host trees.

In a study on the effect of integrated nutrient management and spacing on the growth and productivity of Red Sanders, the seedlings raised in the nursery were planted in the block plantation.

4. Subsidiary Activities

SKUAST-K SRINAGAR

Plantation Drives and Green Campus Initiatives

A series of plantation drives were conducted across various locations in the valley, targeting government institutions, barren lake banks, and degraded lands. The weeklong plantation initiative commenced on 14th March 2024, led by the Hon'ble Vice-Chancellor of SKUAST-K, Prof. Nazir Ahmad Ganie. During the drive, thousands of trees, including broad-leaved species like Elm, Poplar, and Walnut, as well as conifers such as Deodar and Kail, were planted on the degraded lands at the Faculty of Forestry, Benhama campus. Another plantation drive took place on 5th June 2024 at Sri Pratap College, part of the Cluster University, where hundreds of conifers were planted on the college lawns and periphery. A similar effort was organized at Government Higher Secondary School, Rainawari, Srinagar, on 6th March 2024, where students and staff received on-site technical guidance.

Additionally, under the Lifestyle for Environment (LiFE) program, a weeklong plantation and awareness drive, themed "Ek Paed Maa Ke Naam," was conducted starting 16th September 2024. This initiative involved planting trees at various government institutions, middle and high schools, the Faculty of Forestry, hostel premises, and barren lands, with active participation from AICRP-AF staff and students.

School Adoption under the Green Campus Initiative

As part of the Green Campus Initiative Mission, two schools were adopted for environmental sustainability. On 10th June 2024, a plantation drive and awareness program were conducted at Government Higher Secondary School, Gulabagh, where free planting materials and expert guidance were provided to the school officials.

Following a request from Government Middle School, Watlar, the school was adopted, and a plantation drive was held on 18th September 2024. The AICRP-AF team prepared pits, and hundreds of trees were planted across the






school's 10-kanal land. The event was attended by the Zonal Education Officer of Lar, along with schoolteachers and students.

Advisory Services

Advisory services were provided to the Forest Department, Social Forestry Department, and agroforestry farmers across the valley. The Government Agriculture Department in District Baramulla received guidance for establishing an agroforestry nursery under the HADP program. Additionally, in response to a request from CAFRI, Jhansi, scientists from AICRP-AF evaluated three nurseries for accreditation, preparing and submitting the evaluation reports in the prescribed format to CAFRI, Jhansi.

SKUAST-J, JAMMU

On 17th September 2024, under the banner of "Ek Ped Maa

Radio talks/ Field Visits / Lectures delivered/ training programmes attended

S.No	Name of the Event	Date	Topic	Venue	Resource Persons Involved
1.	Kisan Mela 2023	04-05 March 2024	Farmer-scientist interaction and sale of forest QPM	Shalimar	SAF Division scientists
2.	Importance of Forests in Addressing Climate Change	14 September 2023	Role of forests in climate change	FoF-Benhama	Dr. G.M. Bhat
3.	Soil Health & Ecosystem Restoration for Sustainable Production	20 December 2023	Agroforestry for rehabilitation of degraded lands	FOA-Wadura	Dr. G.M. Bhat
4.	Apprentice FCLA Training Programme	August, September, November, December 2023	Training programme for apprentice FCLA of University	Division of SAF, FoF-Benhama	-
5.	Training on Soil Health & Ecosystem Restoration for Sustainable Production	09-14 September 2024	Agroforestry: Greening the degraded lands	Faculty of Agriculture	Dr. G.M. Bhat
6.	Training Programme Sponsored by ESDP, Ministry of MSME	30 October - 05 November 2023	Development of high-tech nursery of conifers and broadleaved tree species for livelihood development in Kashmir Himalaya	Govt. Degree College Kangan Ganderbal	AICRP AF
7.	International Conference on Climate Change	10-12 February 2024	Growth performance and carbon stock potential in horti-agriculture systems under degraded land conditions of Benhama Ganderbal	Afghanistan	Dr. G.M. Bhat
8.	NAHEP (Overseas Programme)	Two months	Visit to Griffith University Nathan Campus	Australia	Dr. Meghna Rashid
9.	Visit of NAHEP Director and Nodal Officer CAFRI Jhansi to Srinagar Centre	28-29 May 2024	Review of Srinagar Centre	Benhama Ganderbal	-

Ke Naam," AICRP-AF, SKUAST Jammu organized a plantation drive with active participation from students, during which 35 tree saplings were planted. Additionally, significant observances related to forestry, agroforestry, and environmental conservation, including Van Mahotsav, Earth Day, and World Environment Day, were celebrated in collaboration with various university units, promoting awareness and fostering engagement in environmental sustainability.

YSPUHF, SOLAN

The department successfully conducted two farmer training and awareness programs on the 25th and 26th of September 2024, with 100 farmers participating. The Morus and Grewia-based agroforestry systems were modified into an apple-based agri-horti-silviculture system to demonstrate income diversification and climate change mitigation strategies for hill farmers. Integrated agroforestry systems were developed, incorporating species such as *Moringa oleifera, Morus alba, Grewia optiva, Diospyros kaki, Melia composita, Gmelina arborea, Toona ciliata*, and *Leucaena leucocephala*, arranged in various configurations. The poplar-based agroforestry system was replaced with a Gmelina arborea-based system, and the Beetal breed of goats was introduced to the dairy farm to promote diversification. Approximately 25,000 seedlings and slips of multipurpose plants, bamboo, and grasses were distributed to farmers and stakeholders. The Municipal Corporation of Shimla received 1,000 bamboo seedlings and 10,000 slips of Vetiver and Napier grasses for landslide area reclamation, while 1,000 fodder tree seedlings including 300 Grewia, 300 Morus, 300 Kachnar, and 100 Leucaena—were provided to a model farm for Van Mahotsav celebrations and the establishment of a fodder block. Van Mahotsav was celebrated at the department level with significant participation. Additionally, three M.Sc. students completed their degrees on the agroforestry farm, and two others are currently conducting research in the experimental agroforestry area. A demonstration plot was also established to commemorate the International Year of Millets.

CSKHPKV, PALAMPUR

During the reporting period, the center successfully accredited two nurseries for producing quality planting material, as directed by CAFRI, which oversees the national production of quality planting materials. The center also collaborated with the State Forest Department under the Agroforestry Sub-Mission Program and was awarded a mini-project valued at ₹24 lakhs to establish a nursery for producing quality planting material for agroforestry species.

Under the Transfer of Technology Program, regular monitoring and gap-filling activities were conducted for horticulture-based agroforestry systems developed in Village Thandol, District Kangra. Additionally, the center celebrated Van Mahotsav at the university level on July 21, 2024, during which over 300 fodder, medicinal, and fruit trees were planted on the campus.

AAU, KAHIKUCHI

Nursery Development

The timely availability of seedlings for multipurpose tree species (MPTs) and indigenous fruit trees remains a challenge, as agroforestry species are often inaccessible to agroforesters. To address this, a nursery was initiated during 2021-22 to raise saplings of tree species, fruit trees, and minor fruit trees native to Assam. For seed sowing, polybags of 20 cm x 15 cm size and 100-gauge thickness were filled with a 1:1:1 mixture of topsoil, sand, and compost. Based on the observed outcomes, another nursery was established in 2023-24 under RKVY sponsorship, focusing exclusively on agroforestry tree species to ensure the timely availability of quality planting material.

Block Plantation of *Michelia champaca*

A block plantation of 100 *Michelia champaca* saplings was carried out on the occasion of World Environment Day, 5th June 2024, at AAU – HRS, Kahikuchi Station.

Boundary Plantation of Assam Lemon

A boundary plantation of 150 Assam Lemon saplings was completed in Loharghat, Kamrup, in November 2024.

Vermicomposting

Vermicomposting is being practiced as a sustainable source of income generation, contributing to waste management and organic farming practices.

GBPUAT, PANTNAGAR

Kisan Mela Stall: A stall was set up at the Kisan Mela to facilitate outreach activities and the sale of plantlets to farmers.

Plantation Drive under 'Ek Ped Maa Ke Naam': The plantation drive under 'Ek Ped Maa Ke Naam' was celebrated at the university's Agroforestry Research Centre (AFRC). Plantlets were planted by the Director of Research and other dignitaries, marking the occasion.

Student Visits: Students from various institutes and universities visited the center, enhancing their knowledge and gaining insights into agroforestry practices.

ANDUAT, FAIZABAD

During the awareness program, seedlings and saplings of species such as Eucalyptus, Teak, Melia, and grafted *Emblica officinalis* (NA 7 & NA 8) were distributed to farmers to support the establishment of agroforestry systems and boundary plantations.

RPCAU, SAMASTIPUR

As part of the Mission LiFE (Lifestyle for Environment) to contribute to the national goal of increasing tree cover, the Department of Forestry, PGCA, RPCAU, Pusa successfully organized several events, including an awareness campaign on a pollution-free environment, a cleaning drive, and a pledge to save the environment. On the occasion of the International Day of Forests (21st March 2024), students and faculty members participated in a tree plantation drive at Ghorai Ghat along the riverbank. Additionally, a boundary plantation program was organized on World Environment Day (5th June 2024), during which over 300 Bauhinia variegata, 300 Cassia fistula, and 200 other plants such as Neem, Mahua, and Bail were planted.

A massive plantation drive was organized under the initiative Ek Ped Maa Ke Naam, during which mango trees were planted along the university boundaries and roadsides.

OUAT, BHUBNESHWAR

The *Ek Ped Maa Ke Nam* (Plant for Mother) initiative was carried out in the presence of university authorities, including the Hon'ble Vice Chancellor, Dean of the College of Forestry, faculty members from the Faculty of Forestry, and other associated colleges, with active participation from the scientists of the AICRP on Agroforestry. This program marked the beginning of the plantation of high-value trees around the Krushi Sikhya Sadan (New Auditorium) on the main campus of OUAT, Bhubaneswar.

BAU, RANCHI

On 5th June 2023, World Environment Day was celebrated with a plantation drive at the newly constructed Girls Hostel of the Birsa Agricultural University (BAU) Campus. The event witnessed participation from over 200 individuals, including UG, PG, and Ph.D. students, along with officials, scientists, staff members, and the AICRP on the Agroforestry team.Each participant was provided with a seedling of their choice to take home, with the advice to plant it while involving family members and relatives to further spread the message of environmental conservation.

A symbolic plantation campaign was inaugurated on the occasion, with Sri N.K. Singh, IFS, Additional PCCF & Managing Director, Jharkhand State Forest Development Corporation, Government of Jharkhand, serving as the Chief Guest. The event also saw the presence of Deans, Directors of BAU, and the enthusiastic participation of students at all academic levels.

BCKVV, JHARGRAM

In 2024, the AICRP on Agroforestry at BCKV undertook significant initiatives to advance sustainable agroforestry practices throughout West Bengal. One notable event was the participation in the Krishi Mela held on February 15–16 at BCKV, Mohanpur. The agroforestry stall featured a student quiz involving institutions like BCKV and IISER-Kolkata and farmer awareness sessions, including live demonstrations. This event garnered extensive media coverage, including by Doordarshan Kolkata. An on-farm workshop on February 18 at Haringhata highlighted the practical benefits of the loombu-sweet orange agroforestry model, engaging 26 farmers and demonstrating its role in building climate resilience. World Environment Day, celebrated on June 5 at BCKV Jhargram, was marked by a tree plantation drive involving 300 saplings. The event saw active participation from university scientists and local dignitaries and included competitions, cultural programs, and recognition of nine exemplary agroforestry farmers. On March 1, the Igniting Agroforestry into Creative Minds workshop introduced students to agroforestry's role in climate resilience.

Creative art activities deepened their understanding and fostered interest in sustainable practices. An awareness program on carbon trading held on March 18 provided insights into leveraging carbon credits in agroforestry to enhance farmer incomes and promote sustainable land use. Other outreach efforts included live phone-in programs on Doordarshan and a series of training sessions across the state, addressing topics like boundary plantations and mangrove conservation. These sessions engaged farmers, students, and civic organizations, emphasizing agroforestry's benefits. The Centre also launched the “Ek Ped Maa Ke Naam” initiative, organizing tree plantation drives in tribal villages to instill community responsibility for environmental stewardship.

Collectively, these initiatives heightened awareness, encouraged adoption, and expanded agroforestry practices across West Bengal. “*Har Medh Par Ped*” campaign was organized.

CCSHAU, HISAR

The Research Extension-Farmers Interface Meeting was organized by the AICRP on Agroforestry, Department of Forestry, CCS HAU, Hisar, on May 23, 2024, at Dhani Mahu village, Block Tosham. The event featured in-depth discussions on suitable agroforestry models, tree-crop management, optimal plantation timing, irrigation strategies, and lopping management practices.

SKNAU, FATEHPUR

Awareness Program on Boundary Plantations

An awareness program titled "*Har Med Par Ped*" was conducted on September 8, 2023, focusing on the importance of boundary plantations. A total of 80 participants, including farmers and students, attended the event.

QPM and Nursery Activities

A total of 2,500 seedlings of various tree species were developed at the station, including *Prosopis cineraria*, *Azadirachta indica*, *Tecomella undulata*, *Ailanthus excelsa*, *Moringa oleifera*, *Hardwickia binata*, *Melia azedarach*, *Acacia nilotica*, and *Colophospermum mopane*.

Agroforestry Extension Activities

On July 11, 2023, lectures on agroforestry plantation techniques and their management were delivered at Fatehpur. The event saw the participation of 300 farmers and self-motivated youth, who planted 5,200 trees in the pasturelands of Beer Fatehpur. It was organized by the Mandawa Road Beer Conservation and Development Society and Pinjrapol Society, Fatehpur.

On February 23, 2024, a training program for 50 extension workers on agroforestry and sustainable resource management was held at KVK Fatehpur.

On October 26, 2023, 45 agricultural input dealers from the Churu district visited the station and its agroforestry fields, gaining insights into advanced agroforestry techniques.

Training Programs

A workshop titled "Role of Agroforestry in the Extension of Tree Cover in Rajasthan" was organized on September 8, 2023, with 100 participants, including farmers, students, professionals, and scientists.

SKDAU SARDARKRUSHINAGAR

Establishment of a Model Nursery and Compost Shed (Established in 2008)

Compost Shed

Two compost sheds have been constructed in the herbal garden. Litterfall from various multipurpose trees (MPTs) is collected and processed into enriched compost, which is then utilized within the herbal garden.

Herbal Garden and Model Nursery

A model nursery has been established at the center to propagate seedlings of MPTs, medicinal plants, and other species. These seedlings are raised and distributed to farmers to support sustainable agricultural practices**.**

Extension Activities (2023-24)

To raise awareness and promote agroforestry technologies among farmers, several extension activities were conducted at the Agroforestry Research Station, SDAU, in Salempura village, Taluka Palanpur, District Banaskantha. Efforts focused on building farmers' knowledge, awareness, and skills in agroforestry practices.

Key initiatives included:

Conducting seven demonstrations on *Clusterbean* cultivation (8 kg of seed) on farmers' fields in Salempura village during *Kharif* 2023. These demonstrations involved farmers who had already implemented boundary tree plantations on their fields.

Providing soil sample analysis services to farmers to enhance their understanding of soil health and its management.

MPKV, RAHURI

Land Development and Plantation Activities

This project is tasked with developing approximately 27 hectares of barren hillside land by bringing it under tree plantation. To date, the following have been planted:

1,200 mango trees, 1,200 tamarind trees, 400 custard apple trees, and Forest tree species covering 1 hectare, including Ritha, Arjun, Satada, Behada, Jamun, and Aonla.

Breeder Seed Production Program

A breeder seed production program has been implemented to produce high-quality seeds of gram and soybean. This initiative aims to provide farmers with superior seed material while generating additional income for the project.

Nursery Activities

The project has successfully raised approximately 4,400 seedlings of various tree species, including *Pongamia millettia*: 1,000, *Azadirachta indica*: 500, Reetha: 300, Bamboo: 1,500, *Tamarind*: 1,100

PDKV, AKOLA

All India Radio Talk

The following All India Radio talks were broadcast: "बांबूची व्यापरिक दृष्ट्या लागवड" by Dr. Aarti P. Deshmukh on 13th May 2023, "बांबू बेटांचे अन्य द्रव्य व्यवस्थापण" by Dr. P. D. Raut on 11th December 2023, and "वनशेती मध्ये बांबू लागवड आणि मूल्य वर्धन" by Dr. V. M. Ilorkar on 24th December 2023.

Training Conducted

The following events were organized and conducted: World Environment Day on 5th June 2023; Trainers Training

Programmes on Bamboo Cultivation on 2nd August 2023; Trainers Training Programmes on Bamboo Cultivation and Value Addition on 21st August 2023; Training Programme on Bamboo Cultivation Management Practices on 6th September 2023; शेतकरी प्रशिक्षण कार्यक्रम on Bamboo Cultivation on 11th September 2023; World Bamboo Day on 18th September 2023; and a Training Programme on Quality Seed Collection and Nursery Techniques of Forest Tree Species on 26th October 2023.

Organized World Forest Day : Role of Agroforestry and successful intervention on 21st March 2024

Argil. Exhibition Participated During the Year 2023-24

Shivar Feri at Dr. PDKV, Akola on 30th September 2023; District Agriculture Exhibition in Nagpur from 22nd to 24th October 2023; Agro Vision in Nagpur from 24th to 27th November 2023; District Krushi Mahotsav in Nagpur from 19th to 23rd December 2023; Agro Tech 2023 at Dr. PDKV, Akola from 27th to 29th December 2023; and District Krushi Mahotsav in Bhandara on 29th January 2024.

Visits of Dignitaries

The following dignitaries were met during various engagements: Shri. Bhalerao (PA) to Hon'ble Shri. Nitin Gadkari Sir on 24th April 2023, Dr. Arun Kumar Pandey, Professor, on 9th May 2023, Dr. K. Pandiyan, Scientist from ICAR, GTC, Nagpur on 19th May 2023, Dr. Pratap Toppo, Assistant Professor from IGKV, Raipur on 6th July 2023, Dr. Sharad R. Gadakh, Hon'ble Vice Chancellor of Dr. PDKV, Akola on 17th July 2023, Dr. Chandrshekhar T. from the National Medicinal Plant Board, Pune on 14th August 2023, Dr. Lal Singh, Scientist from NEERI, Nagpur on 21st September 2023, Dr. Narain Medury, Senior Scientist from IIT Bombay on 1st February 2024, Shri. Ashok M. Khadse, Director of BRTC, Chandrapur on 6th February 2024, and Dr. Sushant S from the National Institute of Designing, Bangalore under the Ministry of Commerce, Government of India on 22nd March 2024.

Lectures Delivered as Resource Person

Dr. V. M. Ilorkar delivered two lectures on 2nd August 2023 at RAMETI, Amravati, on the topics "कृषी विकासासाठी कृषी वनशेतीच्या विविध पद्धती" and "वनशेती मध्ये बांबूची लागवड व मूल्यवर्धन." On 21st August 2023, at VANAMATI, Nagpur, he discussed "Agroforestry practices, scope & value addition" and "Bamboo cultivation on private land & value addition." On 6th September 2023, he spoke about "Business opportunity in Bamboo Cultivation" at VANAMATI, Nagpur. Dr. P. D. Raut delivered a lecture on "Nutrient management in commercial bamboo species" at VANAMATI, Nagpur on 22nd August 2023, and another on "व्यापरिकदृष्टया बांबू लागवडी मध्ये अन्नद्रव्य व्यवस्थाप" at BRTC, Chandrapur on 11th September 2023. Dr. V. M. Ilorkar also gave a lecture on "शाश्वत विकासासाठी पर्यावरणपूरक बांबू शेती व मूल्यवर्धनाच्या संधी" at BRTC, Chandrapur on the same day, 11th September 2023. Dr. P. D. Raut concluded with a lecture on "बांबू लागवड तंत्रज्ञान व नर्सरी व्यवस्थापन" at AATMA, Bhandara on 29th January 2024.

Agricultural Exhibitions Participated (2023-24)

Participation included the Shivar Feri at Dr. PDKV, Akola on September 30, 2023; the District Agriculture Exhibition at Nagpur from October 22-24, 2023; Agro Vision at Nagpur from November 24-27, 2023; District Krushi Mahotsav, Nagpur from December 19-23, 2023; Agro Tech 2023 at Dr. PDKV, Akola from December 27-29, 2023; and the District Krushi Mahotsav, Bhandara on January 29, 2024.

JNKVV, JABALPUR

World Forestry Day Awareness Programme

An awareness programme was organized by the Department of Forestry, JNKVV, Jabalpur, on March 21, 2024, to commemorate World Forestry Day. The event aimed to educate students about the importance of forests and biodiversity.

Campaign: "Ek Ped Maa Ke Naam"

On September 17, 2024, a campaign titled "*Ek Ped Maa Ke Naam*" was conducted at the AICRP Agroforestry Farm, Dusty Acre. During the event, 200 multipurpose tree species (MPTS) were planted in the presence of the Dean of the College of Agriculture, the Head of the Department of Forestry, the OIC of AICRP Agroforestry, other officers, and students.

Other Activities

A total of 08 Frontline Demonstrations and 02 On-Farm Trials (OFT) were conducted at farmers' fields, alongside supporting the development of five agri-entrepreneurs through agroforestry-based practices. Agroforestry literature was published and distributed to benefit farmers, and a success story on entrepreneurship development was documented, featuring Krishak DIDI and highlighting the establishment of a drumstick nursery.

PJTSU, HYDERABAD

Inauguration of Farm Pond and Plantation Programme

A farm pond surrounded by diamond mesh fencing, constructed with a budget of ₹5.00 lakhs and sponsored by DBS Tech, Hyderabad, in collaboration with NIRMAAN NGO, was inaugurated at the Agri Biodiversity Park, PJTSAU. The unveiling was performed by Dr. P. Raghu Rami

Reddy, Director of Research, PJTSAU, and Ms. Anice Varkey, Head, HR Business Partner, DBS Tech, Hyderabad.

As part of the event, a plantation drive was conducted, featuring the planting of coconut, palm, and flowering plants in the biodiversity park. The programme saw active participation from 130 employees of DBS Tech, along with Mr. B. Thirupathi, Senior Manager of NIRMAAN NGO, Ms. Ameena Mahnej, CSR Lead from DBS Tech, Dr. A.V. Ramanjaneyulu, Principal Scientist (Agro.) & Head, and Dr. T. Chaitanya, Scientist from the Agroforestry Scheme.

Van Mahotsav-2024 Programme

The Van Mahotsav-2024 was celebrated at the PJTSAU campus with Dr. P. Raghu Rami Reddy, Registrar and Director of Research, PJTSAU, as the Chief Guest. He emphasized the importance of tree plantation, particularly native tree species, highlighting their role in acclimatization, carbon sequestration, and environmental conservation. The event was attended by various university officials, the Associate Dean of the College of Agriculture, Dr. A.V. Ramanjaneyulu, Principal Scientist (Agro.) & Head, Dr. T. Chaitanya, Scientist (Soil Science) under AICRP on Agroforestry, NSS officers, and 50 postgraduate students from the College of Agriculture, Rajendranagar. During this occasion, 165 saplings of neem (*Azadirachta indica*), peepal (*Ficus religiosa*), and champa (*Plumeria obtusa*) were planted to mark the event.

BSKKV, DAPOLI

On 12th March 2024, a Shetkari Melava and agroforestry training were organized for farmers at Sawarde, Ratnagiri District, followed by another session in Kongale Village, Dapoli Tehsil, Ratnagiri District, on 4th October 2024. Additionally, a Shetkari Melava and agroforestry training for farmers was conducted at the AICRP on Agroforestry Centre, CES, Wakawali, Ratnagiri District, on 17th September 2024, with another session held at the same location on 17th October 2024. Nursery management practices activities were also carried out during this period.

TNAU, METTUPALAYAM

Consortium of Industrial Agroforestry (CIAF)

To advance the field of industrial agroforestry, a Consortium of Industrial Agroforestry (CIAF) has been established as a platform for fostering entrepreneurial development. The consortium comprises 523 members and a corpus fund of ₹86.00 lakhs, including diverse stakeholders such as farmers, entrepreneurs, scientists, wood-based industries, rural industries, financial institutions, NGOs, and Farmer Producer Organizations (FPOs).

Mettupalayam Agroforestry Business Incubation Forum (MAFBIF)

Building on the experiences of the consortium, the institute launched the Mettupalayam Agroforestry Business Incubation Forum (MAFBIF), the first initiative of its kind in India, with financial support from the Entrepreneurship Development and Innovation Institute of Tamil Nadu (EDII-TN). During 2023-2024, 03 MOUs were signed with startups to provide financial assistance through EDII. Additionally, 175 incubatees were enrolled as members, and 23 startups were created under the IVP (A) and IVP (B) programs. MAFBIF, in collaboration with FCRI, also registered a Geographical Indication (GI) tag for a traditional curry leaf cultivar known as “Karamadai Senkaambu Curry Leaf,” cultivated in Karamadai, Coimbatore District, Tamil Nadu.

World Environment Day Celebrations

As part of the World Environment Day celebrations, a series of events were organized at FCRI, Mettupalayam to raise awareness about climate action. On 31st May 2023, a program titled "Role of Agroforestry for Climate Mitigation" was conducted for students. On 2nd June 2023, a “Pledge on Lifestyle for Environment” was taken by students and staff. Events like “Environment for Life” on 3rd June 2023 and “Beat Plastic Pollution” on 4th June 2023 highlighted the importance of mitigating plastic pollution.

On 05.06.2023, a Green Digi Quiz and a Tree Plantation Campaign were organized, fostering environmental stewardship among participants.

UAS, DHARWAD

World Environment Day Celebration

The AICRP on Agroforestry, University of Agricultural Sciences (UAS), Dharwad, in collaboration with various line departments, organized an awareness program to commemorate World Environment Day on 5th June 2024. The event took place at the Kelageri Tank premises and the university's main campus, focusing on planting diverse tree species. The program was presided over by the Honorable Vice-Chancellor, Dr. P.L. Patil, UAS, Dharwad, with dignitaries such as Smt. K.G. Shanti, District Judge, Dharwad, Shri Vivek Kavari, Deputy Conservator of Forest, Dharwad, along with university officers, lawyers, scientists, students, and about 200 public participants. During the event, the Vice-Chancellor administered an oath to attendees, emphasizing the responsibility of planting and maintaining trees. Following this, participants planted approximately 200 trees, including species such as jackfruit (*Artocarpus heterophyllus*), Pongamia (*Pongamia pinnata*), mahogany (*Swietenia mahagoni*), champak (*Michelia champaca*), copper pod (*Peltophorum ferrugineum*), and tamarind (*Tamarindus indica*) across the Kelageri Lake premises and the university campus.

"A Tree in the Name of Mother" Campaign – 17th September 2024

The AICRP on Agroforestry, UAS, Dharwad, organized a tree plantation campaign titled "A Tree in the Name of Mother" ("एक पेड़ माँ के नाम पर") on 17th September 2024, focusing on planting 100 diverse tree species within the UAS Dharwad campus.

The campaign was inaugurated by the Honorable Vice-Chancellor, Dr. P.L. Patil, who addressed the gathering on the importance of tree planting in mitigating the adverse effects of climate change.

UAS, BANGALORE

The fodder produced under teak based agroforestry system and Melia dubia based agroforestry system was harvested and given as feed for livestocks in the Agroforestry based IFS demonstration unit. The fodders given as feed to 5 cows and 10 sheeps in the demo unit.

KAU, THRISSUR

Refresher Training for Faculty

Dr. V. Jamaludheen served as a resource person for an online refresher training session for faculty members of the University of Calicut, Kerala, on 9th October 2023, with 30 participants in attendance.

Farmer Seminar and Exhibition

A one-day farmer seminar and exhibition was organized at Velur on 6th December 2023.

Compost Preparation Training

A training session on compost preparation was conducted for 40 students in connection with the Food Forest (Hi-Density Multi-Layer Agroforestry Model). Farmers Reji Joseph and Raju from Jaivorg, Sreekrishnapuram, and Palakkad, also participated in training the students.

Biodiversity Register Training

A training program on Biodiversity Register data collection for volunteers was held at Arimpur Panchayath on 7th February 2024.

World Environment Day Programme

The AICRP on Agroforestry Centre led the World Environment Day celebrations at the KAU main campus on 5th June 2024. The theme for this year was 'Model Fruit Forest and Nutri-Gardens.' The event saw participation from the Hon'ble Vice Chancellor, Director of Research, Dean, and other dignitaries.

Tree Planting Programmes

Tree planting drives were organized as part of the "Ek Ped Maa Ke Naam" initiative on 29th August 2024 and 17th September 2024 at the College of Forestry campus and Nila Girls Hostel.

Expert Talk on Rubber Agroforestry Systems

Dr. Asha K. Raj acted as a resource person on "Rubber Agroforestry Systems in Kerala - Lessons for Nepal" during a session held on 22nd August 2024. The meeting was part of an investment proposal on rubber-agroforestry in eastern Nepal, attended by experts including Dr. Himlal Barar (Senior Scientist, Climate Change, Energy and Low Carbon Development, CIFOR-ICRAF), Adhikari Keshab (ICRAF), and Oli Biswanath (CIFOR).

Seedling Distribution

Approximately 45,000 seedlings of various species such as teak, ailanthus, mahogany, bamboo, macaranga, and sandalwood were sold to farmers during the reporting year.

UAHS, PONNAMPET

World Environment Day

The event was celebrated at Government Primary School and Jnana Bharathi Primary School, Gowthampura village, Sagar taluk. Various tree seedlings were planted within the school premises, involving a total of 86 students and staff.

International Day for Biological Diversity

This program was held at the Main Campus of KSNUAHS, Iruvakki, where wild edible fruit plants were planted by the Hon'ble Vice-Chancellor and other key officers. A total of 118 students and staff participated in the event. Awareness Programme on Boundary Plantation "*Har Med Par Ped*".

5. TSP/SCSP Activities

SKUAST-K, SRINAGAR

Two remote villages, Budshungi Rajwar and Gomal village of Karnah, both located in the border district of Kupwara, were selected for Tribal Sub Plan activities in 2024. Both villages are situated along the zero line. Budshungi, the last village in the Rajwar block, is approximately 250 km from the AICRP-AF Srinagar center. Gomal, located entirely along the zero line near the India-Pakistan border, is over 300 km from the AICRP-AF Srinagar center.

Technical guidance was provided to selected tribal farmers in these villages, with various lectures aimed at helping farmers increase their productivity on small land holdings. Forty-two tribal farmers from both villages were chosen in consultation with the local Namberdars/Chowkidars (village heads nominated by the revenue department).

Feedback from the beneficiaries of Budshungi Rajwar, selected in 2023, was also recorded. Notably, the maize and other crop seeds distributed in 2023 have shown better performance compared to the traditional crops previously grown.

In addition to the AICRP-AF Srinagar staff, several dignitaries participated in the events, including the Associate Director of Research of SKUAST-K, Principals of Government Institutions, and Forest Department officers. During the events, materials were distributed to selected tribal farmers, including agriculture toolkits, hybrid maize seeds, six types of vegetable seeds, perennial fodder seeds, quality plant material for fodder trees, and package of practice materials for raising trees and fodders.Package of practice materials for raising trees and fodders.

SKUAST-J, JAMMU

As part of the efforts to improve the health, growth, and milk production of dairy cattle, Vitamin Mineral Mixtures were distributed to beneficiaries in the villages of Naneter and Palai, located in Block Sumb of Samba district, Jammu and Kashmir, during the year 2023-24. Ensuring the proper intake of vitamins is crucial to prevent diseases, reproductive issues, and growth deficiencies in cattle, as insufficient vitamin levels can lead to lower milk production and poor growth. In addition, Nano urea was distributed to TSP beneficiaries, offering advantages over conventional fertilizers by enhancing yield while being less harmful to the environment and human health.

YSPUHF, SOLAN

During the implementation of various initiatives across Himachal Pradesh, significant efforts were undertaken to benefit the Scheduled Tribe (ST) population in multiple districts.

On October 3, 2023, in Gram Panchayat Giu, Lahaul, and Spiti, small farm equipment, animal medicine kits, and Kisan diaries were distributed to 50 farmers, utilizing a budget of Rs. 99,900. Similarly, on October 4, 2023, in Gram Panchayat Demul, Lahaul, and Spiti, the same resources were distributed, benefiting 51 farmers with an expenditure of Rs. 99,900.

In Chamba district, under the Bharmour Sub-District, farmers in Gram Panchayat Deol received apple, poplar, and salix plants on February 12, 2024, benefiting 58 individuals with an allocation of Rs. 83,600. The following day, February 13, 2024, similar distributions were made in Gram Panchayat Kuleth, assisting 83 farmers at an expenditure of Rs. 1,16,400. Further activities were carried out in Sirmour district, Pachhad Sub-District, on August 16, 2024, where battery-operated sprayers, grass slips, and fruit and agroforestry plants were distributed in Gram Panchayat Shadiya and Gram Panchayat Dilman. These initiatives benefited 67 and 62 farmers respectively, with a combined expenditure of Rs. 2,62,025 (Rs. 1,31,013 in

Shadiya and Rs. 1,31,012 in Dilman). Overall, these activities amounted to a total expenditure of Rs. 6,61,825, directly benefiting 371 individuals across the targeted regions.

CSKHPKV, PALAMPUR

Under STC activities, two agroforestry training sessions were held in the tribal areas of Chamba district and two in Kinnaur district, benefiting a total of 200 farmers and reaching 720 beneficiaries. A brochure on “Grass Production in High Hills” and a "Krishivaniki Training Manual" were prepared and distributed to the trainees for future reference. Farmers received quality planting materials, fertilizers, and small field implements, helping them improve their practices.

In total, 8.45 hectares of farmland in villages Harer, Kandral, and Balla in Kangra district, and 1 hectare in village Sichling (Distt. L&S), were developed under various agroforestry systems using a participatory approach, benefiting 230 beneficiaries. Additionally, over 1 hectare was developed under organic pea cultivation.

Under SCSP activities, one interaction meeting and two agroforestry training sessions were organized, benefiting more than 80 farm families. These sessions focused on animal nutrition, as many of the participating farmers owned milch animals. Farmers were also educated on various agroforestry systems, particularly the silvi-pastoral agroforestry system.

During the reporting period, 165 demonstrations on important *rabi* and *kharif* crops were set up on farmers' fields under the agri-silviculture agroforestry system in Mollichak and BandBihar villages, benefiting over 250 beneficiaries. Inputs such as field implements, quality seeds, and fertilizers were provided to the beneficiaries. Additional demonstrations will be conducted in the winter season.

AAU, KAHIKUCHI

A training session was held at Loharghat, in the Kamrup district of Assam, on boundary plantation under the TSP program on 28th September 2023, where planting materials, including Assam Lemon, black pepper, and Arecanut saplings, were distributed to 169 beneficiaries. However, no programs were conducted after September 2023 due to the non-release of funds under the TSP head. Once the funds are received, activities will resume, including block plantation of *Tectona grandis*, block plantation of *Michelia champaca*, multiple cropping in coconut-based systems, *Gmelina arborea*-based intercropping systems, and the RKVY-QPM/2023-24 project for generating, establishing, and accrediting quality planting material for agroforestry systems. Additionally, studies will be conducted on the soil properties of existing sole and intercropped agroforestry systems at HRS, Kahikuchi, along with the isolation, characterization, and identification of microbial diversity in soils from different agroforestry systems, and optimization of the composting process for quality compost production.

GBPUAT, PANTNAGAR

SCSP activities are conducted throughout the year in the hill and tarai regions of Uttarakhand. To maximize benefits for the community, women-led self-help groups were engaged in these activities. In the first and second quarters of 2024-25, various inputs such as plantlets, small farming equipment, and vegetable seeds were provided to the beneficiaries. In addition, on-site training sessions, as well as sessions at university research centers, were organized to impart technical knowledge on plant protection.

OUAT, BHUBNESHWAR

The TSP activities for 2024-25 were conducted at Techno Village, Durgaprasad, Dasapalla, Nayagarh, where we demonstrated the use of secondary plant nutrients in intercrops within a fruit-based agroforestry system. Additionally, plant protection measures for seasonal

vegetable crops grown in the alleys of teak and Gamhar were showcased. Essential inputs, such as MOP, DAP, and Redomil, were provided to the beneficiaries.

The SCSP activities for 2024-25 were conducted in the non-aspirational district of Puri, Nimapada Block, at Harijan Sahi, Haripur, with the participation of 30 beneficiaries. We demonstrated the use of small tools to reduce drudgery in farm operations. Critical inputs, including shovels, sickles, and garden hoes, were distributed to the beneficiaries.

BAU, RANCHI

A total of 80 tribal farmer families, comprising 321 members from small holding households, have been included in this program. Key activities such as agroforestry, agri-horticulture, fishery, livestock vaccination, poultry, and beekeeping have been incorporated into the program, with a focus on providing technical inputs for agroforestry practices and socio-economic upliftment. Ongoing technical support has been offered to the farmers, along with technical bulletins covering various crops. The farmers have adopted recommended practices for crops such as peas, tomatoes, radishes, cabbage, cucumbers, beans, mustard, and pulses. The soil quality on the farmers' fields has improved following the implementation of these agroforestry and agricultural practices. It has been observed that crop yields have increased, thanks to the provision of quality seeds, proper farm implements, compost, inorganic fertilizers, lime, and karanj cake. Through continuous technical support, TSP farmers have seen improvements in their economic conditions. Many farmers have shown keen intrest in and adopted agroforestry practices.

BCKVV, JHARGRAM

Under the Tribal Sub-Plan and Scheduled Caste Sub-Plan initiatives, several activities were carried out across multiple districts in West Bengal to support the upliftment of Scheduled Tribes and Scheduled Castes populations. These programs focused on awareness, training, and resource distribution to empower these communities.

In TSP activities, nine awareness camps were organized in districts such as 24 Parganas South, Birbhum, Paschim Burdwan, and Jhargram. These camps are primarily aimed at enhancing agricultural awareness and distributing seedlings, benefiting over 215 individuals from the ST communities. Key events took place in villages like Kultali, Katamari, Shyamnagar, Debipur Gurguria, and Dongajora, where the ST population gained practical knowledge and received seedlings for agricultural development.

Similarly, SCSP activities included eleven events across districts such as Paschim Medinipur, Jhargram, Bankura, Purulia, Nadia, and Murshidabad. These activities featured On-Farm Testing (OFT), awareness camps, and dissemination workshops to enhance agricultural practices and skills among SC populations. More than 250 beneficiaries participated in these sessions, with significant interventions in areas like Gaighata, Ramnagar, Kadam Kanon, and Satyapole. The SCSP program continues to encourage sustainable farming practices through field-based learning experiences for SC communities.

SKDAU SARDARKRUSHINAGAR

TSP Project Activities for 2023-2024: During the celebration of "World Environment Day" on 5th June 2024, forest and fruit tree saplings (including Anjan, Mango, Sapota, Karanj, *etc.*) along with small farming equipment (such as bowls, buckets, tubs, jars, *etc.*) were distributed to 30 farmers. Additionally, in the *kharif* season, 2 kg of Castor (GCH 7) seeds per farmer were provided to 30 farmers in Vagdadi. For the *rabi* season of 2023, oat (Kent variety) seeds were distributed to 30 tribal farmers. Two training sessions for farmers were held, along with regular visits to the farmers' fields.

SCSP Project Activities for 2023-24: High-yielding Castor (GCH-7) seeds were distributed to 30 farmers in Jethi village of Amirgadh Block, Banaskantha district. In addition, fertilizers such as DAP and Urea (one bag each per farmer) were given to 30 SC farmers in the same village. Two farmer training sessions were conducted, and regular field visits were made to ensure continuous support.

PDKV, AKOLA

SCSP Report (2023-24)

In the SCSP Report for 2023-24, funds of Rs. 261,157 were received, with a total expenditure of Rs. 252,446, resulting in a utilization percentage of 96.66%. A total of 22 farmers received irrigation materials, including 10 units of Sprinkler Pile 75 mm, 5 units of Foot Baton Assembly 75 mm, 5 units of GI Rizor Pipe, 1 unit of Sprinkler Bend HDPE 75 mm, 1 unit of HDPE Pump Connecting Nipple 75 mm, 1 unit of Sprinkler T HDPE 75 mm, 1 unit of Sprinkler End Cap HDPE 75 mm, and 5 units of Sprinkler Brass Nozzles.

TSP Report (2023-24)

In the TSP Report for 2023-24, Rs. 99,027 were received, with a total expenditure of Rs. 98,464, leading to a utilization percentage of 99.43%. Similarly, 22 farmers were provided with the same irrigation materials, including 10 units of Sprinkler Pile 75 mm, 5 units of Foot Baton Assembly 75 mm, 5 units of GI Rizor Pipe, 1 unit of Sprinkler Bend HDPE 75 mm, 1 unit of HDPE Pump Connecting Nipple 75 mm, 1 unit of Sprinkler T HDPE 75 mm, 1 unit of Sprinkler End Cap HDPE 75 mm, and 5 units of Sprinkler Brass Nozzles.

JNKVV, JABALPUR

Four training programs were organized for the SC community to raise awareness among farmers about the development of agroforestry systems. A total of 136 participants attended the training sessions. Agri-inputs such as seeds, biofertilizers, and planting materials were distributed to the farmers.

PJTSU, HYDERABAD

TSP (2023-24)

The Tribal Sub-Plan was implemented in Kothuru, Mogaralaguppa, Chandrukunta, and Gundalapadu villages in Mulakalapally Mandal, as well as Rachuripally and Ganeshpadu villages in Dammapet Mandal, Bhadradri Kothagudem District, Telangana. Two training programs on eucalyptus, teak, oil palm, sandalwood, and soapnut-based agroforestry systems were conducted at Arlapenta and Ankampalem villages in Dammapet Mandal on July 6, 2024, and at Mogaralaguppa and Gundalapadu villages in Mulakalapally Mandal on July 7, 2024. Additionally, two training sessions on 'Industrial Agroforestry,' combined with sapling distribution, were organized in collaboration with the NGO Society for Sampoorna Grama Swaraj (SSGS), Bhadrachalam, at Mogaralaguppa on July 6, 2024, and at Rachuripally village, Dammapet Mandal, on July 7, 2024. A total of 20,000 eucalyptus saplings (ITC Clone No. 316) were distributed to 20 tribal farmers from Kothuru, Mogaralaguppa, Chandrukunta, and Gundalapadu villages on July 6, 2024. Furthermore, 15,000 eucalyptus saplings (ITC Clone No. 316) and 90 mango saplings (Banganapalli variety) were distributed to 15 tribal farmers from Rachuripally and Ganeshpadu villages on July 7, 2024.

SCSP (2023-24)

The SC Sub-Plan was implemented in Kandhirenigudem and Nancharipeta villages of Motakondur Mandal, Yadadri Bhuvanagiri District, Telangana.

Two training programs focusing on agroforestry systems were conducted for SC farmers.

Inputs including planting materials (sandalwood, casuarina, bamboo, and fruit crops), secateurs, tarpaulins, and lopping shears were distributed to 50 SC farmers from Motakondur, Aregudem, Chada, and Ammanabole villages.

BSKKV, DAPOLI

Under the SCSP and TSP activities, the following items were distributed to SCSP farmers:

milking machine,1 power tiller, 5 brush cutters, 2 Konkan Kanyal goats, 5 quintals of animal feed, 5 knapsack pumps, 5 electrical pumps, 1,620 bamboo seedlings, 120 cashew seedlings, 10 coconut seedlings, 4 nursery shednet bundles.

TNVASU, KATTUPAKKAM

The following training programs were organized at the Directorate of Centre for Animal Production Studies, Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), IAN, Kattupakkam, to benefit farmers:

Popularization of Concentrate Feed for Livestock Farmers (14.2.24): This training, attended by 30 farmers, focused on the importance of concentrate feed for livestock. As part of the program, each farmer received 95 kg of milch cattle feed.

Popularization of Nutrient Supplements Developed at TANUVAS (15.2.24): On this day, 30 farmers learned about the significance of TANUVAS-developed nutrient supplements for livestock. Inputs distributed included TANUVAS GRAND, TANUVAS PAM 21, TANUVAS mineral mixture, and TANUVAS mineralized salt lick.

Millets: The Super Food of this Century (16.2.24): A training on millets was held for 30 farmers, where they learned about the benefits and cultivation of millets. The participants received millet seeds, millet rice, vermicompost, micronutrient mixture, and Panchakavya.

UAS, DHARWAD

Target SCSP Population/Families:

A total of 20 SC farm families were covered under the SCSP programme

UAS, BENGALURU

Schedule Caste Sub Plan (SCSP)

On 17th August 2023, on-farm field demonstrations and training programs on bund and boundary plantations were conducted in the villages of Tollapalli, Devarajapalli, Paathapalya, Yarampalli, and Kallipalli in Bagepalli taluk, Chikkaballapur district. Further sessions were held on 5th March 2024 in Dattehalla, Maadapura, and Devaraja colony, and on 17th September 2024 in Budanuru, Jakkahalli, and Sogahalli villages in H. D. Kote taluk, Mysore district. Forestry seedlings (Silver oak, Mahogany, and *Melia dubia*), horticultural seedlings (Cashew, Coconut, Lemon, and Mango), and agricultural tools (Tarpaulin, Spade, Sickle, Varvari, and Basket) were distributed to 200 identified Schedule Caste beneficiaries.

Tribal Sub Plan (TSP)

On 9th August 2023, 6th September 2023, and 26th August 2024, on-farm field demonstrations and training programs on bund and boundary plantations took place in the villages of Gujjepalli, Gudipalli, Yalagalapalli, Bhairapalli, Thollapalli, Nallasamanapalli, and Bukkanapalli in Bagepalli taluk, Chikkaballapur district, as well as Jeeyara, Chakahalli, and Sollepura Haadi in H.D. Kote taluk, Mysore district. Forestry seedlings (Silver oak, Mahogany, and *Melia dubia*), horticultural seedlings (Cashew, Coconut, Mango, and Lemon), and agricultural implements (Spade, Sickle, Varvari, and Basket) were distributed to 160 identified tribal beneficiaries.

6. Awareness Programme on Boundary Plantation

SKUAST-K, SRINAGAR

Two three-day agroforestry awareness-cum-training programs were held in Budshungi Rajwar (16–18 August 2024) and Gomal Karnah (21–23 August 2024), Kupwara District, J&K, with 67 participants. Coordinated by Dr. G. M. Bhat and supported by CAFRI Jhansi (ICAR, Govt. of India), the programs focused on boundary plantation for sustainable livelihoods. Dr. Megna Rashid Bakshi highlighted agroforestry's role in production improvement and women's empowerment, while Dr. Bhat discussed agroforestry practices and income enhancement. Expert lectures covered entrepreneurship, scientific methods, and best practices. The events were attended by AICRP-AF scientists, panchayat members, and officials.

SKUAST-J, JAMMU

This program aims to raise awareness among farmers and students, encouraging them to plant trees along farm boundaries. Taking into account local soil, climatic conditions, and market availability, this initiative is conducted annually under the AICRP on Agroforestry.

YSPUHF, SOLAN

National Agroforestry Day was celebrated on 8th May 2024, engaging over 120 students to promote agroforestry awareness. The International Day for Biological Diversity was observed on 22nd May 2024 with 150 students participating in various competitions. The "Har Med Par Ped" program was held on 16th August 2024 in Sirmaur district, attracting 127 farmers. World Bamboo Day on 18th September 2023 saw 30 forest guards from the State Forest Department visiting Majhgaon Farm.

CSKHPKV, PALAMPUR

On December 29, 2023, the AICRP on Agroforestry, CSKHPKV Palampur Centre, organized an awareness meeting at Pantheid village, Himachal Pradesh, with 50 farmers, including 27 women. The program promoted the "Har Medh Par Ped" initiative, introducing agroforestry systems like agri-silviculture and windbreaks. Kiwi saplings were distributed, and planting, spacing, and management techniques were demonstrated. Farmers were also trained on weed eradication, land productivity enhancement, and composting. A pamphlet on agroforestry practices was shared with participants.

AAU, KAHIKUCHI

An awareness camp on boundary plantation was conducted in November 2023 at Loharghat, Kamrup, focusing on the plantation of 150 Assam Lemon saplings. The significance of boundary plantation was emphasized in the context of shrinking land resources, the need to mitigate environmental pollution by sequestering greenhouse gases both above and below ground, and ensuring livelihood security. Boundary plantation was highlighted as an effective strategy to address these challenges.

PAU, LUDHIANA

On 23rd August 2024, a training program on agroforestry and boundary plantation was held in Ghanaur block, Patiala, organized by AICRP on Agroforestry and AICRP on Integrated Farming System, PAU Ludhiana. Attended by 50 farmers, topics covered included boundary plantation, dairy farming, kitchen gardening, apiculture, and biogas for income. Experts guided on seedling selection, spacing, tree orientation, and pest management. A total of 400 plants were distributed. Additionally, a tree plantation campaign was held on 12th July 2024 in Ludhiana, focusing on afforestation's role in reducing greenhouse gases and promoting sustainable agroforestry practices.

GBPUAT, PANTNAGAR

A "Har Med Par Ped" plantation drive was conducted with children from the Government Primary School, Haldi, and B.Tech Biotechnology students from GBPUAT, Pantnagar.

ANDUAT, KUMARGANJ AYODHYA

On 30th March 2024, an awareness program on boundary plantations, "Medon Par Vriksharopan," was held in Deeli Giridhar Village, Ayodhya, with 60 farmers participating. Organized by university scientists and the Coordinating Unit, Jhansi, the program focused on promoting agroforestry, boundary plantations, and multipurpose trees (MPTs) under the "Har Med Par Ped" campaign. Seedlings of MPTs were distributed to farmers to establish agroforestry systems and enhance sustainability.

RPCAU, SAMASTIPUR

The "Har Med Par Ped" campaign was organized on 5th June 2023 in Harpur village, involving the Dean, faculty members, and local farmers.

OUAT, BHUBNESHWAR

An awareness program on “Har Med Par Ped”was organized at the Panchayat office in Agapal, Kujang, Jagatsinghpur district, with active participation from farmers, farm women, local political leaders (including the Sarpanch, a high school headmaster, and other Panchayati Raj members), as well as scientists from AICRP-AF and KVK. The event was also featured in the local print media. During

the program, the following saplings were distributed: 300 *Acacia auriculiformis*, 60 Coconut, 60 Arecanut, 60 Mango Grafts, and 60 K. Lime Gooty.

BCKVV, JHARGRAM

Boundary plantation awareness programs were held in West Bengal to promote sustainable practices. On June 5, 2023, 230 farmers in Maniktala village, Jhargram, learned about boundary plantations' benefits. A second session on August 19, 2023, in Kadam Kanon village, Bankura, engaged 65 farmers with practical demonstrations. The third program, on February 15, 2024, during the Krishi Mela at BCKV, Nadia, attracted 139 participants. A total of 434 farmers participated, gaining valuable knowledge on enhancing agricultural resilience through boundary plantations.

BAU, RANCHI

Boundary plantation activities for "Van Mahotsav 2023" were held at BAU Campus on July 18, 2023, with over 100 students, officials, scientists, and staff. 200 MPT saplings, including Gamhar, Teak, Bakain, and Mango, were planted. The event was graced by Smt. Mahua Maji, MP, and other dignitaries. On July 28, 2023, boundary plantations in Ratu Block, Ranchi, involved 40 students and farmers, planting 250 MPT saplings, including Mahogany, Gulmohar, Teak, Neem, Mango, Guava, and Papaya.

CCAHAU, HISAR

A Boundary Plantation Awareness Program was held on December 18, 2023, in Litani Village, Hisar, organized by AICRP on Agroforestry, CCS HAU. Attended by 20 farmers, Eucalypts was recommended for boundary plantations, with farmers expressing strong interest in adopting the practice.

SKNAU, FATEHPUR SHEKHAWATI

An awareness program on boundary plantations titled "Har Med Par Ped" was held on September 8, 2023. The event saw active participation from 80 farmers and students, who engaged in learning about the importance and benefits of boundary plantation.

SKDAU SARDARKRUSHINAGAR

On August 8, 2023, Sardarkrushinagar Dantiwada Agricultural University held a boundary plantation program at Vagdadi village, benefiting 36 tribal farmers. Each received 3 sapota and 2 mango saplings under the Tribal Sub Plan initiative.

MPKV, RAHURI

The annual boundary plantation program is held during Van Mahotsav in July and World Environment Day on June 5, distributing forest tree saplings to farmers and schools for planting along field boundaries and school campuses.

PDKV, AKOLA

An awareness program on boundary plantation was held on September 30, 2024, at Salaimendha village, Nagpur, where 200 bamboo saplings (*Bambusa balcooa*) were distributed, and boundary plantation was carried out on farmers' fields.

JNKVV, JABALPUR

An awareness program on boundary plantation, "Har Med Par Ped," was held at Deori village on December 30, 2023, with 245 farmers, farm women, and youths attending. An on-campus campaign also involved 43 farm women.

PJTSU, HYDERABAD

Boundary plantation of Ficus religiosa was carried out on the PJTSAU campus, Rajendranagar, in September 2024. An awareness campaign was also conducted to engage the students and staff of the College of Agriculture, Rajendranagar, on the importance of the plantation.

BSKKV, DAPOLI

An awareness program on "Har Med Par Ped" was held on November 29, 2023, in Malunge village, Maharashtra, with 35 farmers participating. Dr. S. S. Desai highlighted the benefits of boundary plantations in paddy fields, mango orchards, and cashew farms. Talks on agroforestry tree species, soil management, and sustainable practices were given by local leaders and experts. Farmers showed strong interest in adopting agroforestry and requested more training and field visits.

TNAU, METTUPALAYAM

An awareness campaign on boundary plantation was held on January 10, 2024, in Periyathottipalayam, Coimbatore, promoting tree cover for environmental security, ecosystem services, and additional farmer income. Mr. Duraisamy received saplings of Teak, Malabar Neem, Mahogany, and Kumil for timber and plywood production. An awareness meeting at the Forest College included stakeholders like students, NGOs, FPOs, startups, and farmers to highlight the benefits of boundary plantation.

TNVASU, KATTUPAKKAM

An awareness program on boundary plantation was held in January 2024 at Thirumalrajupettai, Tirutanni, Thiruvallur district. As part of the program, 345 saplings of Sesbania grandiflora were distributed to farmers as inputs.

UAS, DHARWAD

An "Awareness Programme on Boundary Plantation" was organized by AICRP on Agroforestry, UAS Dharwad, on 6th September 2024 at Shri Ashok Satappa Nashipudi's farm in Badakundri Village, Belgavi District. Dr. P.S. Matiwade inaugurated the event, emphasizing the role of tree planting

in combating climate change. Dr. H.Y. Patil discussed agroforestry and bund planting, while Dr. S.T. Hundekar highlighted soil and water conservation. Mr. S.M. Ghatanatti stressed the importance of agroforestry to mitigate climate change. Mr. Shreeshial Vasedar spoke on the economic benefits of planting timber trees. Around 200 saplings, including Teak, Mahogany, Guava, Drumstick, and Pongamia, were planted, with 100 participants. The event concluded with a vote of thanks from Mr. Shivaraj Talwar.

UAS, BANGALORE

On-farm field demonstrations and awareness programs on bund and boundary plantations were held across Bagepalli taluk, Chikkaballapur district, and H.D. Kote taluk, Mysore district. These programs took place in various villages, including Tollapalli, Devarajapalli, Paathapalya, Yarampalli, Kallipalli (17th August 2023), Dattehalla, Maadapura, Devaraja Colony (05-03-2024), and Budanuru, Jakkahalli, Sogahalli (17th September 2024). Forestry seedlings (Silver Oak, Mahogany, *Melia Dubia*) and horticultural seedlings (Cashew, Coconut, Lemon, Mango) were distributed to 200 Scheduled Caste beneficiaries, along with agricultural implements. Similar programs were conducted in Gujjepalli, Gudipalli, Yalagalapalli, and other villages, benefitting 160 tribal farmers.

KAU, THRISSUR

Awareness programs on boundary planting were held by Kerala Agricultural University's All India Coordinated Research Project on Agroforestry. The first was on 30th May 2024 at Velur Grama Panchayath and the second on 12th June 2024 at the Nila PG Girls Hostel, KAU, Thrissur. Inaugurated by Dr. E.V. Anoop, Dean of the Faculty of Forestry, the programs involved 50 participants, including faculty and students. Participants planted 50 seedlings with proper techniques, including alignment, staking, and soil preparation. The sessions included demonstrations and discussions on sustaining and expanding boundary planting for greening.

UAHS, PONNAMPET

UAHS, Ponnampet, conducted three bund and boundary plantation awareness programs on 5th June , 27th August , and 17th September 2024 at KSNUAHS, Iruvaki, and Achapur village, Sagar taluk. A total of 2,460 seedlings, including timber, biofuel, medicinal, fast-growing, and minor fruit plants, were planted.

7. Awards and Recognitions

SKUAST-K, SRINAGAR

Dr. G.M. Bhat received the Best Paper and Presentation Award at the International Conference on Climate Change held in Afghanistan from 10th to 12th February 2024. He was awarded a certificate and a cash prize of 135 USD for his paper titled "Growth Performance and Carbon Stock Potential in Horti-Agriculture Systems under Degraded Land Conditions of Benhama Ganderbal.

YSPUHF, SOLAN

Dr. Rohit Bishist won the Best Paper Award from the Indian Society of Agroforestry for his research on Spiti Valley fodder resources. Dr. Prashant Sharma received the 2023 Outstanding Review Editor Award from Frontiers in Forests and Global Change and grants for the Pre-Congress Workshop (19–22 June 2024, SLU, Sweden) and the XXVI IUFRO World Congress (23–29 June 2024, Stockholm).

AAU, KAHIKUCHI

Received the Outstanding Achievement Award at ICAAAS-2023 (10–16 July 2023) and the Excellence in Research Award in July 2024.

PAU, LUDHIANA

Qadri M. et al. won First Prize for Poster Presentation on "Soil Dynamics under Poplar-Based Agroforestry" at the National Conference by Soil Conservation Society of India, CSAUA&T, Kanpur, Oct 18–20, 2024.

GBPUAT, PANTNAGAR

Dr. Ratna Rai received the Outstanding Horticulture Teacher Award (2021-2022) from ISHRD at PHC 2024, Navsari, Gujarat (18–20 Jan 2024). She won First Prize for her oral presentation on "Soil Microorganisms in Strawberry" and the Eminent Scientist Award at GMST-2024, Karnal, Haryana (21–22 Sep 2024).

OUAT, BHUBNESHWAR

Dr. Manas Ranjan Nayak, Scientist (Forestry), has been selected as one of the esteemed editors for the International Conference on Building Smallholder Climate Resilience for Achieving Sustainable Food Systems.

BCKVV, JHARGRAM

B. Biswas served as a Session Judge at the 31st West Bengal Science Congress (Feb 29, 2024, Kolkata) and Co-Chairman at the 6th National Conference on Nature-Based Solutions (Mar 5–6, 2024, UBKV, Cooch Behar). He was a Member of the State Level Technical Committee on Assured Rice Production, a Lead Expert for WBADMIP, and a Visiting Expert under PMKSY-WDC, Govt. of West Bengal. Biswas was Rapporteur for "Advances in Citrus Production Technology" at the Asian Citrus Congress (Oct 28–30, 2023, Nagpur).

SKDAU SARDARKRUSHINAGAR

Dr. F. K. Chaudhary won the Best Oral Presentation Award for "Cow Urine Enriched Botanicals: A Green Weapon Against Golden Fly in Muskmelon" at Plant Science & Molecular Biology Conference, Sept 11–13, 2023, Valencia, Spain.

PJTSU, HYDERABAD

Dr. A.V. Ramanjaneyulu, Principal Scientist (Agronomy), AICRP on Agroforestry, won the 2023 Best Scientist Award (Agronomy) from Eruvaaka Foundation on Jan 20, 2024, at Malla Reddy University, Hyderabad.

BSKKV, DAPOLI

N.A. Meshram et al. won the Best Poster Award for "Adoption Strategies of Indigenous Climate Resilient Agroforestry Systems in Konkan" at the National Seminar, DBSKKV, Dapoli, on May 7–8, 2023.

TNAU, METTUPALAYAM

Dr. I. Sekar received the Best Presentation Award 2023 from ICAR-CAFRI at the AICRP on Agroforestry Annual Meet in Hyderabad. The Agroforestry Business Incubator won the Top Scale-up Grant Award and ₹5 lakh from STARTUP TN, presented by Dr. A. Balasubramanian, Dr. K.T. Parthiban, and Dr. I. Sekar.

TNVASU, KATTUPAKKAM

The Kattupakkam Centre won the Dr. S. Chinamani Award for Agroforestry Extension (2022). Dr. S. Gunasekaran received the Vaithilingam Rathnasabapathy Innovation Award (2021) and the Young Scientist Award 2023 from the Society of Climate Change and Sustainable Environment.

UAS, DHARWAD

Received First Prize for Best Poster on "Carbon Stocking in Natural Forest" at UAS Karnataka's National Seminar (Jan 2024). Dr. S.T. Hundekar received the Incentive Award from UAS, Dharwad (Oct 2023, Oct 2024).

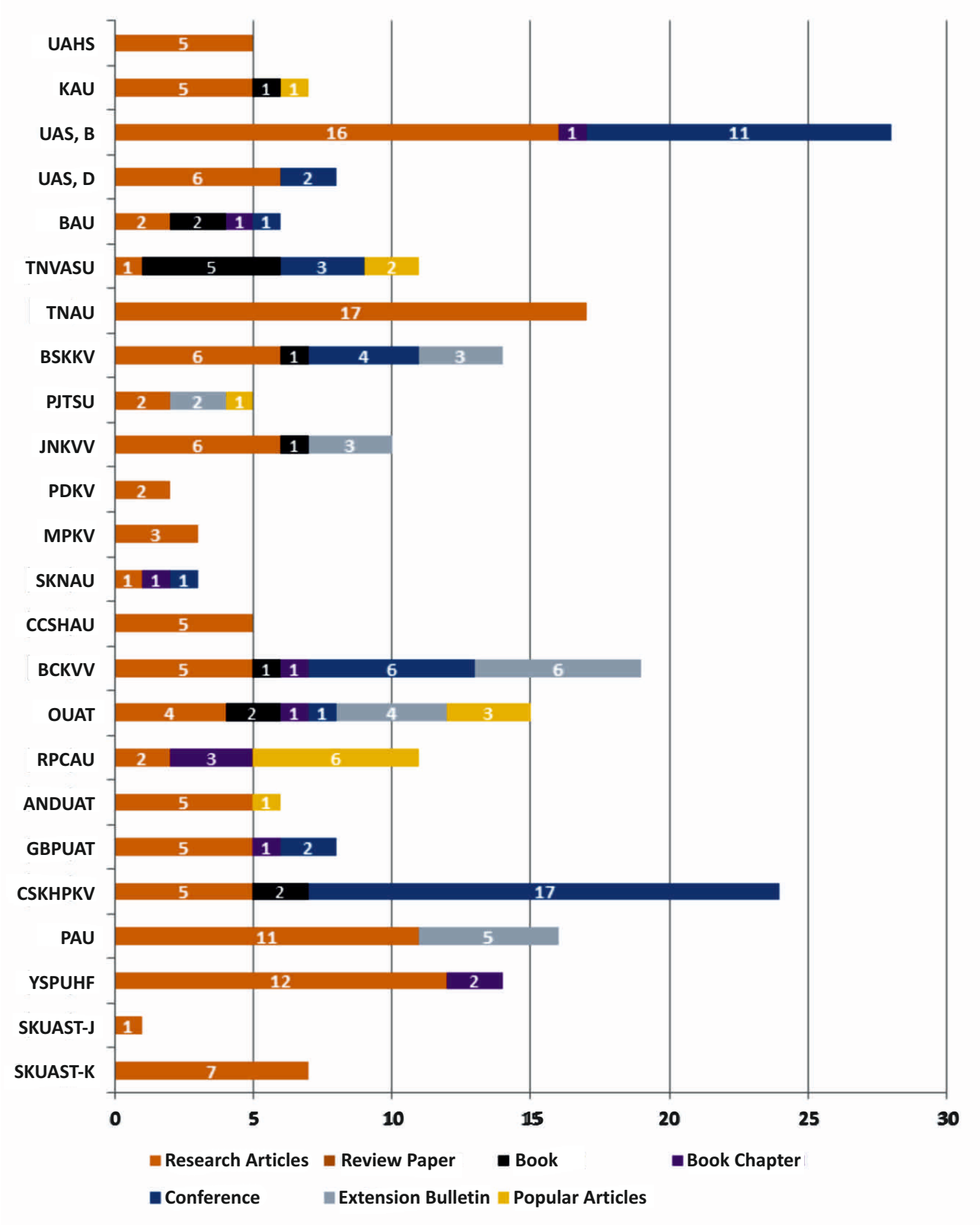
UAS, BANGALORE

Best agroforestry-based Integrated Farming System Demonstration during Krishimela-2023, 20th November, awarded by UAS, GKVK, Bangalore.

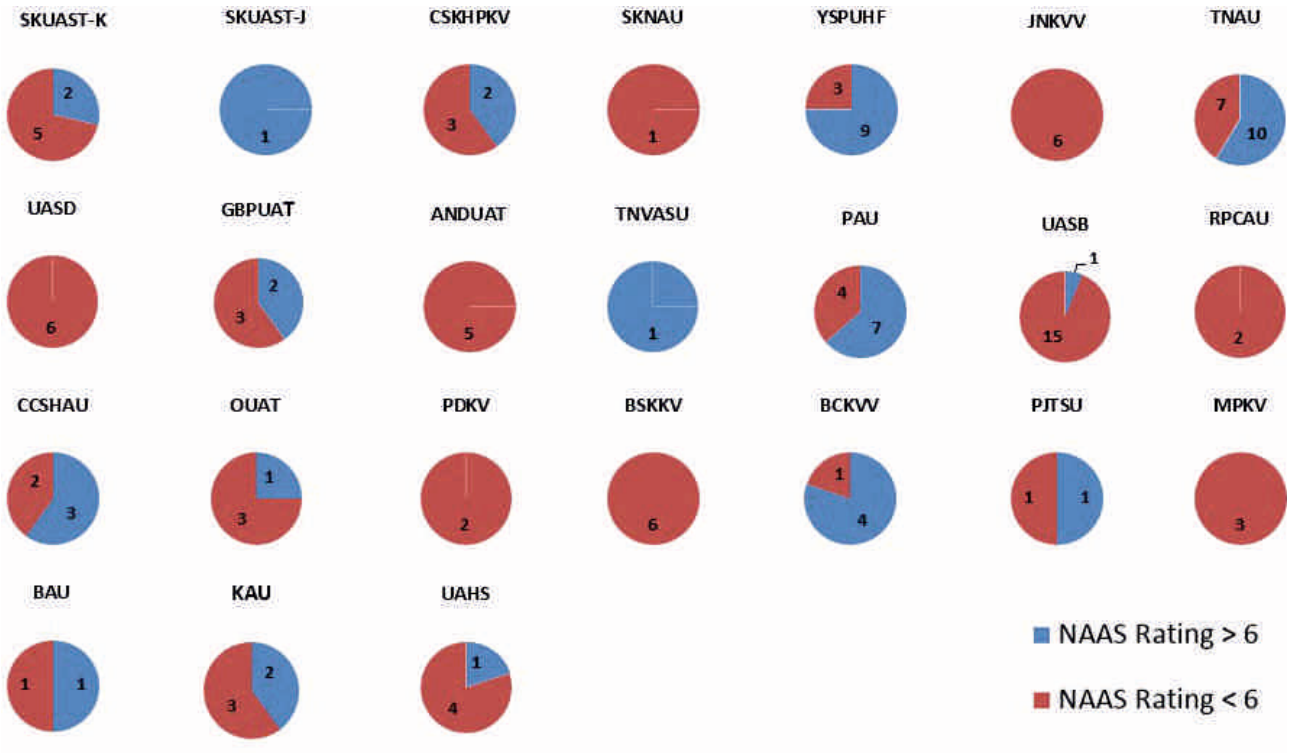
KAU, THRISSUR

Ms. Arya C. received the Young Scientist Award at the 6th International Conference (Mar 2024) and Second Best Poster Award at the National Conference on Agroforestry (Jun 2024).

8. Research Publications



Summary of publications for the year 2021-2022



Scientific articles published in journals sorted based on NAAS rating

9. Budget (2023-2024)

(Rs. in lakhs)

Grant in aid salary:	916.30
Grant in aid General:	263.75
Grant in aid Capital:	15.50
Grant in aid General (SCSP):	25.00
Grant in aid General (TSP):	20.00
Grant in aid Capital (SCSP):	7.61

10. Staff Strength

Sl.No.	Name of the centre	Scientist (02 at each centre)	Tech.	Supp Staff	Total
1	OUAT, Bhubaneshwar	Dr. S.C. Mohapatra and Dr. Manas Ranjan Nayak	1	2	5
2	TNAU, Mettupalaym	Dr. I. Sekar and Dr. K. Vaiyapuri	1	2	5
3	BSKKV, Dapoli	Dr. Suchitra S. Desai and Dr. N.A. Meshram	1	1	4
4	UAS, Dharwad	Dr. H.Y. Patil and Dr. S. T. Hundekar	1	2	5
5	NDUA&T, Faizabad	Dr. S.K. Verma and Dr. Anjali Tiwari	1	1	4
6	SKNAU, (Fatehpur shekhawati)	Dr. Dharmendra Tripathi and Vacant	1	2	5
7	CCSHAU, Hisar	Dr K.S. Ahlawat and Vacant	1	1	4
8	PJTSAU, Hyderabad	Dr. A.V.Ramanjaneyulu and Dr. T. Chaitanya	1	1	4
9	JNKVV, Jabalpur	Dr. S.B. Agarwal and Shri Yashpal Singh	1	1	4
10	TNV&ASU, Chennai (IAN,Kattaupakkam)	Dr. S. Gunasekaran and Dr.M.Suganthi	1	1	4
11	PAU, Ludhiana	Dr. R.I.S. Gill and Dr. Navneet Kaur	1	1	4
12	AAU, Jorhat (HRS, Kahikuchi)	Dr. Kusum Deka and Dr Kaberi Mahanta	1	1	4
13	PDKV, Akola, (COA, Nagpur)	Dr. V.M. Ilorkar and Dr. P.D. Raut	1	1	4
14	GBPUA&T, Pantnagar	Dr. Ashutosh Dubey and Dr. S. K. Lavania	1	2	5
15	MPKV, Rahuri	Dr. R.H.Kolse and Vacant	1	1	4
16	BAU, Ranchi	Dr. P. R. Oraon and Dr Anil Kumar	1	1	4
17	SDAU, SK Nagar	Dr. P.P. Chaudhary and Prof. Lalita Saini	1	2	5
18	YSPUH&F, Solan	Dr. Rohit Bishist and Dr. Prashant Sharma	1	2	5
19	SKUAST-K, Srinagar	Dr. G.M. Bhat and Dr. Megna Rashid	1	2	5
20	KAU, Thrissur	Dr. V. Jamaludheen and Dr. Asha K. Raj	1	2	5
21	BCKVV, Kalayani (HRS, Jhargram)	Dr. Benukar Biswas and Dr. Subhabrata Panda	1	2	5
22	UAS, Bangalore	Mr. Bhaskar, V. and Dr. Hanumanthappa, D.C.	1	1	4
23	CSKHPKV, Palampur	Dr. Rameshwar Kumar and Dr. S.D. Negi	1	1	4
	TOTAL sanctioned	46 (43 in position)	23	33	102

11. Directory of Key Personnel

S.No.	Name	AICRP-Agroforestry Secretariat/Centre	Email	Mobile
1.	Dr. A. Arunachalam	Director, ICAR-CAFRI & Project Coordinator, AICRP-Agroforestry	pc.aicrpaf@gmail.com / director.cafri@icar.gov.in	09412441230
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20.	Dr. P.R. Oran	BAU, Ranchi	bauranchiaicrpaf@gmail.com/ prabhat.ranjan.oraon@gmail.com	07700858024
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24.	Dr. Rameshwar Kumar	CSKHPKVV, Palampur	cskhpauaicrponagroforestry@gmail.com/	08894468888
25.	Dr. Sandeep Sehgal	SKUAST-J, Jammu	skuastjaicrponagroforestry@gmail.com/ sehgals1@yahoo.com	09419109684

26.	Dr Karan Ahlawat	CCSHAU, Hisar	ccshauhisaraicrpaf@gmail.com	07404987000
27.	Dr I. Sekar	FCRI, TNAU, Mettupalaym	sekarsasi14@gmail.com/ fcrimtpaicrponagroforestry@gmail.com/	09443003877
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Proceedings of Annual Group Meeting of AICRP on Agroforestry

Proceedings of Annual Group Meeting of All India Coordinated Research Project on Agroforestry held at ICAR-Central Agroforestry Research Institute, Jhansi on 16-18October 2023

The Annual Group Meeting for 2021-22 held at PJTSAU, Hyderabad to monitor and review the progress of different centres involved in the AICRP on Agroforestry with participation from delegates from CAU/SAUs and ICAR Institutes. The list of attendees is in Annexure 1.

Dr. S.K. Chaudhari, DDG(NRM), ICAR, New Delhi graced the inaugural session as the Chief Guest and guided the R&D process of AICRP-Agroforestry. He emphasized to upscale the germplasm component towards varietal release. Dr. M. Venkata Ramana, Registrar, PJTSAU, Hyderabad Delhi and Prof. R.R. Reddy, Director Research addressed the delegates to utilize the opportunities in agroforestry into action-oriented research and technology development. Dr. Ch. Srinivasa Rao, Director, NAARM, Hyderabad gave an exciting lecture on leadership and research management which was well-received by all delegates. Dr. A. Arunachalam, Director, CAFRI & Project Coordinator, AICRP-Agroforestry presented the overview of the AICRP on Agroforestry with specific emphasis on its salient achievements during the last one year.

The Chief Guest released the Annual Report-2023 of AICRP on Agroforestry, monographs, books and technical bulletins brought out by different centres. The inaugural session was attended by all ICAR-CAFRI scientists, staff, and employees. The event was coordinated by Dr. A.V. Ramanjaneyulu, OIC of the AICRP-Agroforestry, PJTSAU, Dr. A. K. Handa, Principal Scientist and Sh. Suresh Ramanan, S., Scientist and the vote of thanks was given by Dr. A.V. Ramanjaneyulu. For the first time, the agroforestry scientists working in different other ICAR Institutes that are not involved in the AICRP Agroforestry were also invited and scientists from CRIDA, IISWC, IIFSR, NIASM and CARI, Port Blair had participated in the Group Meet.

During the technical sessions conducted on the 16th of October, 2023, the Officers-in-charge (OICs) of the AICRP centres presented their progress reports. The house and experts present discussed on each of the presentations and provided valuable suggestions for further improvements. The Project Coordinator also appreciated the efforts for presenting the common experiments in the centres collectively.

Special lecture by Dr. Jadish Tamak, General Manager (Plantations), ITC Ltd., Bhadrachalam was well received by the delegates. The lecture gave some good insights on the industry perspective of doing agroforestry.

An excellent Invited lecture on Agroecological principles of Agroforestry by Dr. C. Biradar, Country Director, CIFOR-ICRAF's India Office also received the attention of the participants and gave a global perspective of digital applications in agroforestry.

On the second day i.e. on the 17th October, the progress reports presentation of Officers-in-charge (OICs) continued under the Chairmanship of Dr. Rajbir Singh, ADG (AA&CC), NRM, ICAR, New Delhi. Apart from guidance to

the presenters, the ADG insisted on documentation of success stories based on the intervention from AICRP centres. Dr. B.P. Bhatt, Principal Scientist, NRM, ICAR, New Delhi recommended the OIC should explore new thematic areas like Genomics, Variety/Clone development, Hydrology & Evapotranspiration Carbon and Calories, Nutrients and Nutrition, Scoping the entire plant, Tree-crop-livestock integration, Soil Health, Value addition, Tools and tool kits, etc. in the ambit of agroforestry under the AICRP on Agroforestry project. Also, Dr. Bhatt highlighted the proposal for including IGKVV, Raipur as one of the voluntary centres of AICRP-Agroforestry as the present composition of the AICRP Centres has no representation from the State of Chhattisgarh that was agreed in principle.

On the 17th October, 2023, an exclusive session on Tree Genetic Resources Accessioning and Registration was also organized for the benefit of the delegates. Dr. K.P. Mohapatra, Principal Scientist from NBPGR, New Delhi gave a useful presentation on handling of germplasms for IC and EC registration and elite genotypes with the National Repository of Plant Genetic Resources. The AICRP unit at ICAR-CAFRI shall enable the process through CAFRI's Germplasm Identification Committee and the AICRP-Variety Identification Committee.

On the sidelines of the AICRP Group Meeting, a National Symposium on Quality Planting Material was also organized where it was informed to house that the Ministry of Agriculture and Farmers Welfare has notified the ICAR-Central Agroforestry Research Institute, Jhansi as nodal agency for QPM related activities. The AICRP unit of ICAR-CAFRI also presented the recent developments on the Quality Planting Material (QPM) including accreditation framework for nurseries. Commenting on the development, the ADG advised that AICRP centres must be roped in as nursery auditors during the piloting of the framework.

The delegates visited the experimental fields and the agrobiodiversity park of the PJTSAU on the 18th October, 2023 and perused the field trials of various germplasm.

The group meeting ended with commitment to all partners and delegates to adhere to the decisions taken and action points devised with timelines. It was also reiterated that OICs should present only the progress of AICRP on agroforestry work and refrain from presenting other scientific achievements to avoid duplicity in reporting. All centres are requested to get in touch with the AICRP secretariat for any assistance regarding data analysis and interpretation. Emphasis was given more on innovation in the approach of doing research, new experiments to meet the current needs and also good publications and products. All the delegates acknowledged the support of Indian Council of Agricultural Research specifically the Natural Management Division and PJTSAU, Hyderabad

In the concluding session, Shri E. V. Venkat Reddy, Director, Institute of Forest Biodiversity, Hyderabad gave the concluding remarks and Dr. Rajbir Singh, ADG (AA&CC), ICAR gave the valedictory address and gave away the Certificates given to centres that made good oral presentation. During the address, the ADG (AA&CC) also guided the Project Coordination Unit to also involve various other partners that works extensively on agroforestry in different agro-ecologies. On the eve, a few retiring officers involved in AICRP-Agroforestry were also felicitated along with all the dignitaries and the Chairpersons who conducted different technical sessions.

On the 17th October, 2023, the first meeting of the AICRP-Agroforestry Variety Identification Committee (AVIC) was convened in PJTSU, Hyderabad that considered and scrutinised two proposals: one on identification of neem variety proposed by ICAR-CAFRI (Dr. K. Rajarajan) and recommended the same for varietal release based on the data through multilocation trials and the second, regarding the multi-location trails proposed for elite genotype of *Cassia auriculata* as proposed by Dr. S. Kala from Kota Centre of IISWC, Dehradun and recommended multi-local trials in at least three different agro-climatic conditions. The proposal was accepted and recommended for further necessary action.

The Annual Group Meeting concluded with a group photograph.

Annexure 1

List of attendees:

S.No.	Delegate details
1.	Dr. S.K. Chaudhari, DDG, NRM, ICAR, New Delhi
2.	Dr. S. Rajbir Singh, ADG (AA & CC), NRM, ICAR, New Delhi
3.	Dr. A Arunachalam, Director and Project Coordinator, ICAR-CAFRI, Jhansi
4.	Dr. B.P. Bhatt, Principal Scientist, NRM, New Delhi
5.	Dr. E.V. Venkat Reddy, Director, ICFRE-IFB, Hyderabad
6.	Dr. C. Biradar, Country Director, CIFOR-ICRAF, New Delhi
7.	Dr. P. R. R. Reddy, Director of Research, PJTSAU, Hyderabad
8.	Dr. M. Venkata Ramana, Registrar, PJTSAU, Hyderabad
9.	Dr.V.K. Singh, Director, CRIDA, Hyderabad
10.	Dr. M.A. Aarif Khan, Ex OIC, PJTSAU, Hyderabad
11.	Dr. B. Joesph, Prof. (Rtd), PJTSAU, Hyderabad
12.	Dr. B. Mohan Kumar (Former VC and ADG)
13.	Dr. K.P. Mohapatra, NBPGR, New Delhi
14.	Dr. Jadish Tamak, General Manager (Plantations), ITC Ltd., Bhadrachalam
15.	Dr. Anil, BAU, Ranchi
16.	Dr. MS Malik OIC, BAU, Ranchi
17.	Dr. PR Oraon, BAU, Ranchi
18.	Dr.B.R. Najan, MPKVV, Rahuri
19.	Dr R H Kolse, MPKVV, Rahuri
20.	Dr. D. Tripathi, SKNAU, Fatehpur Shekhawati
21.	Dr. F.K. Chaudhary, SDAU, S K Nagar
22.	Prof. Lalita Saini, SDAU, S K Nagar
23.	Dr.D.K. Das, RPCAU, Pusa
24.	Dr. Benukar Biswas, BCKVV, Jhargram
25.	Dr. Subhabrata panda, BCKVV, Jhargram
26.	Dr A.V. Ramanjaneyulu, PJTSAU, Hyderabad
27.	Dr T. Chaitanya, PJTSAU, Hyderabad
28.	Dr. G.M. Bhat, SKUAS&T-K, Srinagar
29.	Dr Megna Rashid, SKUAS&T-K, Srinagar
30.	Dr.V. Jamaludheen, KAU, Thrissur
31.	Dr. Asha. K. Raj, KAU, Thrissur
32.	Dr I Sekar, FCRI, Mettupalayam
33.	Dr.K.Vaiyapuri, FCRI, Mettupalayam
34.	Dr Ashutosh, GBPUA&T, Pantnagar
35.	Dr. Ratna Rai, GBPUA&T, Pantnagar
36.	Dr S C Mohapatra, OUAT, Bhubaneshwar
37.	Mrs. Sasmita Behera, OUAT, Bhubaneshwar
38.	Dr. D.C. Dr Hanumanthappa, UAS, Bangalore
39.	Mr. V. Bhaskar, UAS, Bangalore

40.	Dr. Ramakrishna Hegde, CoF, Ponnampet
41.	Dr Rohit Shisit, YSPUHF, Solan
42.	Dr. Prashant Sharma, YSPUHF, Solan
43.	Dr. Sandeep Sehgal, SKUAS&T-J, Jammu
44.	Dr Rameshwar Kumar, CSKHPKV, Palampur
45.	Dr Nanak Dev Negi, CSKHPKV, Palampur
46.	Dr. Sanjay Verma, ANDUAT, Ayodhya
47.	Dr. Anjali Tiwari, ANDUAT, Ayodhya
48.	Dr. S. Gunasekaran, TANUVAS, Kattupakkam
49.	Dr.M Suganthi, TANUVAS, Kattupakkam
50.	Dr Sushil Kumari, CCSHAU, Hisar
51.	Dr. Kaberi M, HRS, Kahikuchi
52.	Dr. Kusum Deka, HRS, Kahikuchi
53.	Dr. R.I.S.Gill, PAU, Ludhiana
54.	Dr Navneet Kaur, PAU, Ludhiana
55.	Dr Sangram, Chavan, ICAR- NIASM, Baramati
56.	Dr. V.M. Ilorkar, CoA, Nagpur
57.	Dr P. Raut, CoA, Nagpur
58.	Dr K B Sridhar, ICAR-CRIDA, Hyderabad
59.	Mr. S.M. Ghatanatti. UAS, Dharwad
60.	Dr S. T. Hundakar, UAS, Dharwad
61.	Dr. H.Y. Patil, UAS, Dharwad
62.	Dr Suchitra Desai, BSKVV, Dapoli
63.	Dr. Sangita Sawant, BSKVV, Dapoli
64.	Dr N.A. Meshram, BSKVV, Dapoli
65.	Dr. A. K. Handa, ICAR-CAFRI, Jhansi
66.	Dr. R. P. Dwivedi, ICAR-CAFRI, Jhansi
67.	Mr. Suresh Ramanan, S., ICAR-CAFRI, Jhansi
68.	Dr. K. Rajarajan, ICAR-CAFRI, Jhansi
69.	Dr. Asha Ram, ICAR-CAFRI, Jhansi
70.	Dr. Kala, ICAR - IISWC center Kota
71.	Dr. Jaishankar, ICAR - CIARI
72.	Dr. Chavan Sangram, ICAR -NIASM, Baramati
73.	Dr Jagadish Tamak, ITC, Bhadrachalam
74.	Mr. Raghu Vamshi, Elixir company
75.	Mr. CVR Ganesh, Gavage organics
76.	Ms. Deepthi R Shastry, ATREE, Bangalore

Annexure 2

Geo-reference of AICRP-Agroforestry Centres

S.No.	AICRP-Agroforestry Centre	Latitude_(N)	Longitude_(E)
1	OUAT, Bhubaneswar	20.265150	85.811684
2	TNAU Coimbatore	11.323766	76.936223
3	BSKKV, Dapoli	17.749701	73.178443
4	UAS, Dharwad	15.488958	74.981328
5	NDUA&T, Faizabad	26.541274	81.832011
6	SKNAU, Jobner, (Fatehpur Shekhawati)	26.965915	75.377555
7	CCSHAU Hisar	29.143798	75.712791
8	ANGRAU, Hyderabad	17.322801	78.417214
9	JNKVV, Jabalpur	23.215662	79.958184
10	TNV&ASU, Chennai (IAN, Kattupakkam)	13.162908	80.243667
11	PAU, Ludhiana	30.901028	75.807112
12	AAU, Johrat (HRS, Kahikuchi)	26.105423	91.612185
13	PDKV, Akola, (COA, Nagpur)	21.144657	79.073815
14	GBPUA&T, Pantnagar	29.022919	79.487865
15	RPCAU, Pusa, Samastipur	25.986368	85.672956
16	MPKV, Rahuri	19.349365	74.646559
17	BAU, Ranchi	23.442346	85.315329
18	SDAU, SK Nagar	24.321776	72.317756
19	YSPUH&F Solan	30.864403	77.169633
20	SKUAST Ganderbal	34.213271	74.809752
21	KAU Thrissur	10.547918	76.279359
22	BCKVV, Kalyani (HRS, Jhargram)	22.456774	87.012040
23	UAS, Bangalore	13.078259	77.579190
24	CSKHPKV Palampur	32.100341	76.546845
25	UAHS,Shivamoga (CoF, Ponnampet)	12.144602	75.938187
26	SKUAST- Chatha, Jammu	32.653089	74.807106
27	CSWCR&TI, Dehradun	30.344669	78.014273
28	ICAR RC NEH Region, Barapani	25.684529	91.912973
29	ICAR RC NEHRegion (Imphal, Manipur)	24.828910	93.926543
30	ICAR RC NEHRegion (Gangtok, Sikkim)	27.319730	88.601934
31	ICAR RC NEHRegion, (Agartala, Tripura)	23.906503	91.313108
32	CSSRI, Karnal	29.708226	76.954191
33	ICAR RC Eastern Region (Ranchi Centre)	23.285277	85.411615
34	CAZRI, Jodhpur	26.262476	72.996741
35	CRIDA, Hyderabad	17.348655	78.501310
36	CARI, Port Blair	11.613934	92.715734
37	ICFRE-IFGTB, Coimbatore	11.017319	76.951150

Notes

Swachh Bharat Abhiyan

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