

CHAPTER-VII

TROPICAL FOREST RESEARCH INSTITUTE JABALPUR

The Tropical Forest Research Institute (TFRI) came into existence as an institute in April 1988 though its origin goes back to 1973 as a regional centre of FRI, Dehra Dun. It has served as a major nucleus for research on forestry and ecology related problems of tropical forests of the region.

The institute has the mandate of carrying out research on issues like rehabilitation of mined areas, eco-restoration of Vindhyan, Satpura, Maikal hills, western ghats; planting stock improvement; agroforestry; non-wood forest products; and forest protection. For enhancing forest productivity, research activities of the institute have been aimed at production of quality planting materials, use of biofertilizers, use of biopesticides etc.

PROJECT COMPLETED DURING 1997-98

NIL

OLD PROJECTS CONTINUED DURING 1997-98

Project 1: Establishment and management of clonal seed orchards, seedling seed production areas and multiplication gardens of Teak.

Objectives: Establishment of clonal seed orchards, seedling seed production areas and multiplication garden of Teak for production of quality planting material.

Achievements

A total of 2.5 ha of clonal seed orchard of teak with 20 genotypes was established in complete randomized design in TFRI campus. Replacement of casualty in orchards and multiplication gardens of teak was completed. CSO, SSPA and multiplication gardens of teak raised in previous years were maintained.

Project 2: Development of Model Research Nursery and studies on improved nursery technology and vegetative propagation of MPT spp.

Objectives: Development of Model Research Nursery with latest facilities for carrying out nursery research and production of quality planting stock. Standardization of nursery technology and vegetative propagation of important MPT spp.

Achievements

Construction work for erection of shade house (18 x 12 m) and potting mixture shed (15 x 5 m) has been completed recently. Equipments and materials like Soil mixer, pH meter, conductivity meter, root-trainers [150 CC Hikopots (25 cells/block) 1625 No. and 300 CC Hikopots (12 Cells/Block) 3340 No.], root trainer stands; 400 No. (for 150 CC Hikopot block). 850 No. (for 300 CC Hikopot blocks) have been procured.

A trial was carried out to study the effect of polybag size and number of perforations at the bottom on growth and quality parameters of *Acacia nilotica* seedlings raised on Mounted Angle Iron (MAI) beds. The treatment T3 (Polybag size 23 x 11 cm with 4 perforations at bottom)

performed best in respect of seedling growth parameters. However, the treatment T10 (Polybag size 11 X 6 cm with 2 perforations at bottom) recorded parallel values for most of the seedling quality parameters.

Another similar trial was carried out in respect of *Albizia procera*. The treatment T3 (Polybag size 23 x 11 cm with 4 perforations at bottom) performed best in respect of seedling growth parameters. However the treatment T12 (Polybag size 11 X 6cm with 6 perforations at bottom) recorded equally good values for most of the seedling quality parameters.

Rooting response of ten indigenous provenances of *Azadirachta indica* under the effect of IBA 1000 ppm was studied in RBD under intermittent mist conditions. Mandore (Rajasthan) provenance showed best rooting response with 91.11 % rooting while Kalyani (West Bengal) provenance showed poorest overall rooting response with 60 % rooting and lowest root length and root dry weight.

Project 3: Studies on seed technology of important MPT species.

Objectives: To conduct studies on germination behaviour, vigour and health of seeds of important MPT species.

Achievements

A trial was laid out to study the effect of seed dressing fungicides on mycoflora of seeds of *Sesbania sesban*. Twelve fungi were isolated from the seeds of *Sesbania sesban*. *Aspergillus* spp. were found to be predominant. Dry seed treatments with Bavistine, Dithane M-45 and Thiram were effective in checking growth of various fungi associated with seeds.

Twenty provenances/seed sources of *Dalbergia sissoo* Roxb. scattered over almost its entire natural range in India were studied for pod, seed and germination characteristics. The provenances T6 (Muzaffarnagar, U.P.), T1 (Kanpur, U.P.) and T7 (Kotdwar, U.P.) were found to be most vigorous on the basis of germination characters studied.

Thirteen selected provenances/seed sources of *Acacia nilotica* were studied with respect to seed morphology and germination characteristics. Observations suggest that considerable variability exists among the seed sources, which can be utilized for tree improvement programmes.

Project 4: Study of nutritional value of some forest species.

Objectives: Estimation of nutritional and anti-nutritional constituents and removal of toxic factors.

Achievements

Among the parameters quantified, total carbohydrate content in *C. fistula* flowers of three localities ranged from 5.33 to 11.44 percent and nitrogen content varied from 0.30 to 0.32 percent. Crude protein content was almost same in all three localities upto 2.02 percent. Tannin content ranged from 4.17 to 6.82 percent. Calcium, magnesium, potassium, phosphorus were found in good amount. Ascorbic acid content ranged from 0.05 to 0.19 mg/100g. Total ash was found to be 7.6% and phenol content occurred in traces.

Project 5: Investigation on allelochemical effects of leaf leachates of agroforestry tree species.

Objectives: Impact of aqueous extracts of agroforestry tree species on chemical and bio-chemical changes of *Vigna radiata* and its compatibility.

Achievements

Allelopathic activity of different tree species viz., *Tectona grandis*, *Dalbergia sissoo* and *Dendrocalamus strictus* was studied in bioassays on germination and seedling growth of *Vigna radiata* (K-851) variety. 10 and 20% leaf and root extracts of all tree species, with rhizobium isolates and nitrogen adversely affected leaf chlorophyll of 'mung' as compared to control. Leaf protein of mung was also reduced by leaf extracts of all species with rhizobium isolates and nitrogen treatments. Root extract of *Dalbergia sissoo* and *Tectona grandis* with all treatments reduced leaf protein whereas stimulatory effect was shown by bamboo root extract. Leaf and root extracts of all species with rhizobium isolates and nitrogen promoted carbohydrate content of *Vigna radiata* (mung) leaves.

Project 6: Screening of phyto-chemicals of forest plants and ascertaining their utility in pest control.

Objectives: Studies on bio-chemical constituents of plant-origin for pest control.

Achievements

Bio-active constituents of *Parthenium hysterophorus* (aerial part) and *Jatropha curcas* (seeds) were isolated, purified and tested against insect and nematode pest under laboratory conditions.

Parthenin, isolated and purified from *P. hysterophorus* was evaluated against teak, sissoo and bamboo insect pests. More than 50% antifeedancy and mortality was observed at 1% concentration.

Jatropha curcas seed extractives were fractionated by chromatography and fractions were screened for their pesticidal activity. Some fractions showed activity at very low concentration (i.e. 0.01%) and 100% mortality was observed at 1% concentration.

Project 7: Screening of species tolerant in lime kiln areas of M.P. (India).

Objectives: Role of chemical and bio-chemicals in plants forming major community in lime kiln areas.

Achievements

Plant samples (leaves of *Butea monosperma*, *Calotropis procera*, *Ailanthus excelsa* and *Dalbergia sissoo*) were collected from lime kiln areas in Katni District, MP in different seasons from different distances. Samples were analysed for chlorophyll, protein, ascorbic acid, sugar, proline and polyphenol content. Pollutants (Sox, Nox and SPM) caused a decrease in chlorophyll, protein and polyphenols in all the species. Changes in chemical parameters at different distances were found significant when compared with control. But the most adverse effect could be seen upto 100 meter distance of lime kiln.

Project 8: Chemical examination of leaves of *Tectona grandis*, *Albizia procera*, Bamboo in relation to resistance against their key defoliators.

Objectives: (a) Loss in biochemicals in leaf litter of teak and bamboo due to decomposition. (b) To arrive at a method for quantitative estimation of condensed tannins.

Achievements

Leaf litter of teak and bamboo was collected from Silviculture Nursery, TFRI, Jabalpur and Barha experimental area respectively. Condensed tannin, protein and total carbohydrates were quantitatively estimated every month. Significant loss in bio-chemicals was observed due to leaf litter decomposition. The above loss in biochemicals was correlated with recycling of nutrients and resistance of the tree against insect pests.

Project 9: Germplasm collection of grasses, bamboos and fruit yielding tree species of forest origin and their multiplication.

Objectives: (a) Germplasm collection of different species of bamboo, *Diospyros melanoxylon* and grasses for introduction. (b) Selection of fruit yielding trees of forest origin and edible bamboo and development of multiplication techniques. (c) Cultivation of Edible Bamboo (*Dendrocalamus asper*).

Achievements

Surveys were conducted to assess bamboo resources in MP, Orissa and Maharashtra. *D. strictus*, *Bambusa bambos* occur naturally in these areas. *Bambusa nutans* and *B. vulgaris* are being popularly grown by tribals. Seventeen accessions of these species have been collected till now.

Bambusa vulgaris (green), *B. bambos*, *B. nutans*, *B. tulda*, and *D. membranaceus* are being multiplied and planted in multiplication garden.

Grass (*Cymbopogon martinii*) was harvested at full bloom stage at 10 cm above the ground level. During 1997, observations on selected 10 random plants belonging to 17 accessions were made in terms of no. of tillers and per plot fresh weight of grass, besides recording herbage and oil yield per net plot on dry basis. Jhabua accession contains highest percentage (0.75) of palmarosa oil amongst collected accessions.

A field survey was conducted for selection of superior trees of *Aegle marmelos*, *Phyllanthus emblica*, *Madhuca longifolia* var. *latifolia* and *Buchanania lanzan* in different forest areas of M.P., Maharashtra and Orissa. Eleven accessions of *Aegle marmelos*, 6 accessions each of *Phyllanthus emblica*, *Madhuca longifolia* var. *latifolia* and *Buchanania lanzan* were collected.

Successful demonstration plots of Edible bamboo were established at Jabalpur and Kanker. *D. asper* saplings were distributed to farmers and state forest departments to popularise cultivation and introduction of bamboo species in Central India.

Project 10: Agroforestry models of Bamboo cultivation on degraded agricultural lands (IDRC).

Objectives: (a) To develop appropriate Bamboo agroforestry models for use in the region. (b) To determine the ecological/socio-economic viability and acceptability of the models to strengthen the collaborative research activities.

Achievements

Various agroforestry models like Bamboo-soybean, Bamboo-mustard, Bamboo-wheat, Bamboo-niger, Bamboo-urad, Bamboo-arhar and Bamboo-moong were developed on degraded agricultural lands. *B. bambos* showed maximum growth as compared to *D. strictus* and *B. nutans* with respect to number of shoots per culm, length of shoot and thickness. VAM inoculation played significant role in bamboo growth.

Project 11: Market survey of prevailing tree species and forest products.

Objectives: To find out the market rates of forest products such as round and sawn timber.

Achievements

Market surveys were carried out on quarterly basis to obtain market rates of sawn and round timber of selected species viz. *Tectona grandis*, *Shorea robusta*, *Eucalyptus* spp. and *Bamboos* from Nagpur, Jabalpur and Raipur districts. Market prices of forest products such as fuelwood and fodder from the same places were also collected. All the data were compiled, tabulated and analyzed for actual outcome and will be published in a quarterly bulletin.

Project 12: Socio-economic study under UNDP Project.

Objectives: To conduct socio-economic survey in the selected villages and compile the data regarding distribution and survival of seedlings under the UNDP projects.

Achievements

Socio-economic surveys were conducted in 15 villages, five each in the districts of Chhindwara, Jabalpur and Bastar. The data thus collected were compiled. More than 50% of plants supplied through UNDP have been protected and maintained by farmers in these villages.

Project 13: Genetic improvement of Teak: Identification of genotypes and clonal multiplication for establishment of breeding/advanced generation production population.

Objectives: To find out genotypes (parents) having high general combining ability. Clonal multiplication of genetically tested parents.

Achievements

An experiment was started with six half-sib families of teak in 1987 at Dhandatopa, Orissa. Data recorded on height, diameter and basal area in 1997 were analyzed and genetic parameters estimated.

Of the 6 clones, clone ORANP-1 and ORANP-5 were best combiners as evidenced by their positive gca values. These two elite parents have been clonally multiplied for establishment of breeding/advanced generation production populations.

Project 14: Studies on seasonal variation in relation to adventitious root induction and associated bio-chemical changes in shoot cuttings of *Tectona grandis*.

Objectives: Effect of IAA, IBA and NAA on rooting. Screening suitable diameter classes for rooting. Establishing relationship between exogenous (environmental) and endogenous factors and callusing and rooting performance.

Achievements

Callusing and sprouting of cuttings were observed from January to July attaining maximum values from March to June. The rooting occurred in the month of May only. Of the auxins tried, IBA resulted in optimum induction and growth of roots enhancing rooting percentage by 65 % over the control. The diameter suitable for cuttings for rooting was screened to be 1.73-2.00 cm. The exogenous factors for rooting include warm humid weather with specification : 80 % R.H. and 13 h day length.

Project 15: Vegetative propagation, physiological and biochemical studies on *Azadirachta indica*, *Pongamia pinnata*, *Albizia procera* and *Dendrocalamus asper*.

Objectives: To develop vegetative propagation techniques by using shoot cuttings for multiplication of superior genotypes and study the impact of season and physiological factors on adventitious root formation.

Achievements

The vegetative propagation technique through shoot cuttings for neem and *Pongamia pinnata* has already been standardized. Air layering technique for neem tree propagation has been standardized. Air layering gave > 90 % rooting in the months of July, August and September.

Albizia procera does not root easily. The cuttings collected from 6 years old trees gave 25 % rooting only in the month of February and there was no rooting in remaining months. However, 60 to 75 % rooting was observed in the cuttings of 2 years old seedlings of *A. procera*. The seasonal variation in adventitious root formation in *Dendrocalamus asper* was studied. Double nodal cuttings from 2 years old culm were used for vegetative propagation. In February and April it gave 35 % rooting and in remaining months the rooting percentage was < 20 %.

Project 16: Developing tissue culture protocols for bamboo species (*B. nutans* and *B. tulda*) in *in vitro* propagation of *Albizia procera*.

Objectives: Establishment of shoot cultures from juvenile and mature plant derived explants. Standardization of medium for shoot multiplication and rooting. Hardening of *in vitro* raised plants and their transfer to soil.

Achievements

Shoot culture was established from explants derived from mature clumps and seedlings. A 5-6 fold shoot multiplication in seedling cultures and another 3-4 fold shoot multiplication in mature clump were obtained in both the bamboo species. A rooting success of 60-70 % in *B. nutans* (seedling) and 40 % rooting in *B. tulda* (mature) were obtained. *In vitro* raised plantlets were successfully hardened and transferred to soil.

Direct shoot formation (without callus) was obtained from leaflets in *Albizia procera*. The buds obtained from leaflets were found to be elongated on elongation medium and shoot multiplication was achieved using nodal segments from *in vitro* raised shoots. The *in vitro* elongated shoots were successfully rooted on rooting medium. Rooted plantlets were transferred to soil after hardening.

Project 17: Developing tissue culture protocol of *Dendrocalamus strictus*.

Objectives : To develop an efficient tissue culture protocol for mass scale plantlet formation:

Achievements

For the first time, 4.5 fold multiplication rate has been achieved in *Dendrocalamus strictus* with MS medium supplemented with BAP 3 mg/l + triacontanol (a 30 - Carbon primary alcohol). 20% rooting has been achieved with various combinations of NAA and IBA.

Project 18: Developing tissue culture protocol for *Bambusa vulgaris* (green) and Tissue culture of *Kaempferia galanga*.

Objectives: Clonal propagation with *in vitro* system of high multiplication and rooting rates.

Achievements

Four fold multiplication of shoots was achieved on cultures established through nodal segments from mature culms. More than 80% rooting was obtained on auxin supplemented MS medium in *Bambusa vulgaris* (green). In the field, tissue culture raised plantlets exhibited 100% survival along with good performance.

13 fold shoot multiplication was obtained on MS medium supplemented with auxins and cytokinins in *Kaempferia galanga*. 100 % rooting was achieved. A single medium has been formulated on which shoot multiplication as well as root development takes place simultaneously.

Project 19: Studies on diseases of important tree seeds, nurseries, plantations, stored wood and bamboos and their control.

Sub-Project 19(1): Studies on the management of diseases of forestry seeds.

Objectives: Identification of seed mycoflora of forest tree species and elimination of mycoflora by fungicidal treatment. Study of the impact of seed borne fungi on germination and development of disease symptoms in young seedlings.

Achievements

Seed mycoflora of *Albizia lebbek*, *A. procera*, *Sesbania grandiflora* and *Dalbergia sissoo* was recorded. *Aspergillus flavus*, *A. niger*, *Fusarium* sp., *Rhizopus* sp. and *Curvularia lunata* were found associated with the seeds. Fungi like *Fusarium pallidoroseum*, *A. niger*, *Curvularia pallescens* and *Alternaria* caused seed rot and seedling wilt in *Dendrocalamus strictus* and *D. membranaceus*, *Bambusa tulda* and *Bambusa* sp. Seed treatment with certain fungicides enhanced germination of seeds. *Fusarium oxysporum* caused seed rot and seedling wilt in bamboo species.

Sub Project 19(2): Studies on the diseases of forest nurseries and their control.

Objectives: (a) To identify the cause of nursery diseases and study the disease epidemiology. (b) To assess the damage caused by nursery diseases. (c) To develop control measures for diseases.

Achievements

Seedling wilt disease of *D. sissoo*, *L. leucocephala*, *A. nilotica*, *S. robusta*, *T. indica*, *A. senegal*, *A. auriculiformis*, *A. catechu*, *E. officinalis*, *C. fistula*, *D. regia*, *P. roxburghii* and *D.*

strictus was treated to *Fusarium oxysporum*. Wilt disease was favoured by high temperature and acidic soil condition. Control was achieved by sterilizing nursery soil with drenching of formaldehyde solution and bavistin 0.2% before seed sowing. Foliage of 20 different provenances of Neem seedlings was studied. Thirty one diseases on foliage inflorescence and fruit of medicinal plants in nurseries were recorded and identified.

Sub Project 19(3): Integrated management of diseases in plantations.

Objectives: Assessment of the damage caused by diseases and adoption of integrated management practices to combat the disease situation.

Achievements

Mortality in one year old teak plantation raised by ENBEE Plantation Ltd. at Budni was noticed. This disease was caused by *Fusarium palliclaroseum*, a soil borne pathogen. The disease can be controlled by drenching with 0.2 % bavistin 200 ml/plant before monsoon. Dying of teak in Mandla was found due to infection of *Phomopsis tectonae* which can be controlled through controlled burning and spray of Dithane M-45, 0.2% before onset of monsoon.

Sub-Project 19(4): Studies on decay in living trees; stored wood; bamboos; and timber and its control.

Objectives: Identification of causes of decay in standing trees, stored wood and bamboos.

Achievements

Ganoderma lucidum was found to cause Ganoderma root-rot and mortality in plantation trees of *Acacia nilotica*, *Albizia lebbek*, *A. procera*, *Azadirachta indica*, *Butea monosperma*, *Cassia siamea*, *Dalbergia sissoo*, *Delonix regia* and *Tectona grandis* in TFRI campus. Variation in the fruit bodies collected from different tree species and their cultures are being investigated. *Ganoderma colossium* was found to cause butt rot in a *Delonix regia* trees hitherto unrecorded.

A new root and butt rot diseases causing top dying and mortality in 6 years old *Albizia procera* plantation was discovered and investigated in TFRI campus. The fungus was identified as *Spongipellis spumeus* and nearly 20% trees of a block of 89 trees were found affected.

Project 19(5): Biological control of some important diseases of forest tree species.

Objectives: (a) To identify and culture potential antagonistic and parasitic fungi and plant species for the control of root diseases of forest nurseries caused by *Fusarium* spp. and *Macrophomina phaseolina*. (b) To prepare formulation and delivery system for field application.

Achievements

Rhizosphere mycoflora was screened for their antagonistic activity against the root diseases of *Acacia catechu* caused by *Fusarium sambucinum* var. *coeruleum*, of *Albizia procera* by *Fusarium avenaceum* and of *Moringa pterygosperma* by *Fusarium acuminatum*. *Aspergillus* sp. I, *Aspergillus* sp. II and *Trichoderma virens* were found to be the best antagonists against the three pathogens, respectively.

Formulations have been prepared for *Aspergillus* sp. I, *Aspergillus* sp. II and *Trichoderma virens* for field trials using bagasse in powder form to give 2-3x10⁹ colony forming units per gram of material.

The formulations were tested against *Fusarium* wilts of *Acacia catechu*, *Albizia procera* and *Moringa pterygosperma* in root-trainers and seed beds. Formulation of *Trichoderma virans* was found to be effective against the three pathogens of the test species indicating its effectiveness as a broad spectrum biocontrol preparation.

Project 19(6): Management of Ganoderma root rot in Economic tree species.

Objectives: Identification of root-rot disease in forest tree species.

Achievements

In the initial stage of studies, *Ganoderma* root was reported from plantations of *Dalbergia sissoo*, *Delonix regia*, *Parkia javonika* and *Albizia procera*.

Project 20: Studies on the role of mycorrhizae and biofertilizers, their mass production and field application in multipurpose tree species.

Objectives: To study the effect of VAM fungi and *Rhizobium* on growth, survival and biomass production in teak, bamboo, *A. procera*, etc.

Achievements

Nursery experiments were conducted to study the effect of VAM fungi and N fixer on growth, survival, biomass and P uptake in teak; effect of VAM and *Rhizobium* on *A. procera*; and effect of farmyard manure on VAM spore production in rhizosphere of *D. asper*. Significant effect of VAM fungi and associated N fixer (*Azospirillum* sp.) was found on survival, biomass, root colonization and P uptake in teak seedlings grown in sterilized soilrite medium. Maximum effect was noticed in VAM + *Azospirillum* treatment followed by VAM and *Azospirillum*. The effect of dual inoculation of VAM fungi and *Rhizobium* was studied on growth and biomass of *A. procera*. Significantly higher biomass was recorded in VAM + *Rhizobium* treatment. Use of farmyard manure as small doses enhanced spore production (5.3 - 17.8 times more) in the rhizosphere of *D. asper*.

Sub-Project 20(1): Studies on mycorrhizae and biofertilizers, their mass production and field application.

Objectives: Survey, collection, isolation and identification of symbionts occurring in tropical deciduous forest plantations and nurseries.

Achievements

Collection of VAM fungi for teak from Maharashtra and M.P. and *Rhizobium* for *A. procera* from Durg (M.P.) was made. Isolation of VAM fungi and *Rhizobium* and maintenance of pot cultures was carried out. Soil samples for VAM fungi were collected from Chandrapur (M.S.) and Balaghat (M.P.) and VAM fungi in pot cultures were isolated. *Rhizobium* from root nodules of *A. procera* collected from Durg M.P. was isolated. VAM fungi were also collected for *Casuarina* from Bhubaneshwar, Orissa. An experiment was initiated to screen suitable VAM fungi for teak.

Sub-Project 20(2): Studies on ectomycorrhizae in Sal, Eucalyptus and other species.

Objectives: Survey of mycorrhiza forming fungi in sal forest and Eucalyptus plantations and isolation, identification and bulk culturing of selective genera for introductory trial in nurseries and plantations.

Achievements

Mycorrhiza forming sporophores of two interesting genera - *Pisolithus tinctorius* and *Calvatia candida* have been noticed in 10 years old *Eucalyptus camaldulensis* plantation. Symbiotic colonization and their periodical occurrence has been correlated with rainfall and atmospheric humidity.

Project 21: Development of afforestation methodology for mined areas in Central India.

Objectives: To find out nature and characteristics of the spoils, occurrences of native species, and suitable conservation methods.

Achievements

Studies are being carried out on coal mine overburdens at Bisrampur, iron-mine overburden at Dalli Rajhara, copper mine overburden at Malanjhand and manganese mine overburden at Balaghat. Suitable species have been identified for each of the mined areas after analysing the physico-chemical characteristics and nutrient status of the spoils.

Project 22: Studies on pollution absorbing efficiency of different forest species in industrial area.

Objectives: To assess pollution load in industrial areas, enumerate native species occurrences at different grid points from the pollution source, study chemical and biochemical characteristics of plant species.

Achievements

Studies are being conducted at Korba industrial area and limekiln area at Katni. Different pollutants (SPM SO₂, NOX etc.) have been estimated at different grid points. Native species occurrence was studied at different grid points. Morphological, chemical and biochemical characteristics of the plant species have been studied. Sensitivity indices were worked out, different species were graded and indexed as pollution tolerant or sensitive.

Project 23: Development of afforestation methodology for different types of mined over areas, degraded and wastelands, economic evaluation of biologically reclaimed coal mine overburdens.

- **Objectives:** To determine present level productivity of the plantations and projected value of further growth.

Achievements

Suitability of species for coal mine overburdens was determined and suitability indices were calculated. Soil compost combination for pit filling was worked out and nutrient uptake by test species (*A. procera*) was determined for various treatments applied. Husk and grasses were found to be most effective in increasing growth, biomass production and nodulation.

Project 24: Post afforestation influence on soil properties and moisture regime under some selected species in M.P.

Objectives: To ascertain the impact of different vegetation on soil attributes with special reference to its physico-chemical properties.

Achievements

Growth performance of 17 even aged species planted in TFRI campus was studied, Analysis of soil samples collected from different plantation revealed minor changes in soil properties due to plantations of different species. Moisture studies conducted after 78 months of planting showed appreciable increase in moisture content under different vegetation as compared to open land.

Project 25: To identify pests of forest tree seeds in nurseries, plantations and control through cultural practices and biological techniques.

Objectives: To identify various insect pests of seeds and plants in nurseries and plantations.

Achievements

On the basis of the damage caused by various insect pests to *A. procera* in nurseries and young plantations, key pest was identified as *Spirama retorta*. It was recorded that *A. lebbek* is preferred host plant followed by *A. procera*, *A. amara* and *A. falcataria*.

Egg parasitoid, *Trichogramma* sp. and a larval parasitoid *C. hepaliae* were found to be potential parasitoid against teak defoliator and skeletonizer. The technique of multiplication of potential larval parasitoids *C. hepaliae* has been initiated in laboratory.

Among the pesticides of botanical origin, 4 selected plant species viz., *Lantana camara*, *Annona squamosa*, *Calotropis procera* and *Ipomoea carnea* were subjected to detailed studies. Biological activities of different components of these plants were tested. Leaves of all the 4 plants and flowers of *L. camara* and *I. carnea* were identified as effective components.

An experiment was conducted on 20 clones of teak belonging to six states of India. (Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa and Uttar Pradesh) to study the natural resistance and early growth performance. Results revealed that the clones of ORANP-7 of Orissa state was the most resistant. Clones ORANP-7 and ST-20 proved best on the basis of resistance and growth.

Project 26: Computerized NWFP Database Management.

Objectives : To develop a database package for storing information on "NWFP".

Achievements

Database structure has been created for storing information on "NWFP"s and programmes are being written to perform queries based on Botanical name, Local name, Zone code, Family and Distribution. The significant features of this package are that it is rapid and has interactive access to available information on NWFP.

Project 27: Training in Computer fundamentals and office automation using MS office and basic computer skill for JRF/SRF/PDF/RA.

Objectives: To enhance the computer skill of Scientist/Officer/Staff of the Institute.

Achievements

During the training emphasis was given on improving basic computer skills like word processing and data processing skill of the participants.

Project 28: Identification of wood decaying fungi through cultural characters.

Objectives : To create database for wood decaying fungi.

Achievements

Data base is designed for identification of wood decaying fungi through cultural characters. Work is going on.

Project 29: Hardware/Software Maintenance and technical support to officers and staff.

Objectives: To extend software facility, Email/Internet facility and statistical analysis of data.

Achievements

Software facility was extended to all research workers through out the year. Around 18 machines, running on Win 95, Win 3.1 using MSOFFICE, OFFICE-97 etc. have been maintained. Two Pentium machines have been procured and few of existing machines have been upgraded. Email/Internet facility was extended to all research workers. Technical support was provided to the research workers for data analysis of various projects using SPSS/ SX etc.

Project 30: Catalytic effect of tree planting on forest productivity in degraded tropical lands.

Objectives: To find out the variation in flora diversity between plantations of different species. To estimate the variation in soil properties and soil micro fauna under different plantations.

Achievements

Investigations were made to estimate and compare diversity of ground flora species growing under various plantations raised on degraded Bhata (lateritic) land near Bilaspur in Madhya Pradesh. Fourteen ground flora species have been identified during September under *Soymida febrifuga* plantation followed by 13 species under *Dendrocalamus strictus* and 12 species under *Lagerstroemia parviflora* and Eucalyptus hybrid plantations as against 6 species under open land.

Project 31: Biodiversity study in JFM areas and adjoining forests.

Objectives: To assess the growth of major tree species in protected and unprotected area. To study the regeneration status of major tree species. To study the status of ground flora. To study the population of major tree species.

Achievements

Vegetation assessment of community managed forests protected for periods of 4,6 and 8 years has been carried out in three villages along with adjacent non protected areas in Sambalpur (Orissa).

In all the villages, the number of species was higher in protected areas. Diversity index was found to be least in 4 years protection areas which gradually increased in areas protected for 13 years.



Children's participation in Mushroom cultivation, Kunjapali, Orissà



Acorus calamus in NWFP nursery - a field demonstration



Colocasia esculenta (Arvi) under *Dalbergia sissoo*
(2m x 2m) in silvi-olericulture system



Wheat, seedless Lemon and Poplar - an agri-horti-
silvicultural model

Project 32: Study of Biodiversity in Tropical Forest Ecosystem of Satpura National Park, Madhya Pradesh.

Objectives: To study the floristic composition of various communities in the Park. To study the physico-chemical attributes and vegetation dynamics.

Achievements

After the analysis of collected data of vegetation, three plant communities have been recognised corresponding to different elevations and different forest types.

- 1) *Syzygium cumini* - *Terminalia tomentosa* (800-1500 m elevation)
- 2) *Shorea robusta* - *Terminalia tomentosa* (800-1100 m) and
- 3) *Chloroxylon swietenia* - *Terminalia tomentosa* (<1000 m).

Project 33: Research on tree farming models in association with instant income yielding crops such as grasses, medicinal plants, agri crops, perennial pigeon-pea etc. with a view to motivating farmers.

Objectives: Development of suitable agroforestry models.

Achievements

Two shade tolerant crops *Colocassia esculenta* (Arvi) and *Curcuma longa* were raised under 5MPT's. The yields varied from 90 to 130 Q/ha. of *Colocassia* and 7.5 to 1.5 Q/ha of turmeric. The order of suitability was observed to be *Albizia procera* > *D. sissoo* > *Tectona grandis* > *Gmelina arborea* > *A. nilotica* for *Colocassia* and *A. procera* = *A. nilotica* > *D. sissoo* > *G. arborea* > *T. grandis* for turmeric.

Project 34: Multipurpose trees for Agroforestry.

Objectives: To test babul paddy model in Chhatisgarh region.

Achievements

Acacia nilotica ssp. *cupressiformis* has been introduced in place of *A. nilotica* ssp. *indica* for its narrow crown advantage in order to realize more yield. Also, JR-75 short duration high yielder has been introduced in place of traditional long duration upland rice varieties in Chhatisgarh region. The improvement sought has been achieved atleast initially over the past three years. The crop yield has increased with new variety and new trees have been showing great promise.

Project 35: Studies on productivity and decomposition patterns of some tree species in Alley cropping under tropical sub-humid conditions of Central India.

Objectives : To study impact of alley cropping on productivity and decomposition pattern.

Achievements

Sesbania sesban alleys were used to raise maize in kharif and cowpea in rabi with definite advantage of green manure, and better moisture regime with mulching in rabi. The experiment is being conducted now with four more species viz. *Cassia siamea*, *C. glauca*, *Albizia procera* and *Leucaena leucocephala* with maize and wheat rotation, by introducing the concept of alley cropping.

Project 36: Vegetative propagation of fruit yielding and ornamental species.

Objectives: To devise vegetative propagation technique of fruit yielding and ornamental species.

Achievements

89% of cuttings showed rooting in *Platanus orientalis* with application of Rootex 'B' powder. Large number of ornamental and fruit yielding species were multiplied through application of Rootex 'B' and prontex powders. Large scale plantations of fruit yielding and avenue trees were planted in the Institute campus. Large number of fruit yielding and ornamental species have been supplied on demand.

Project 37: Collection of ethnobotanical data from various tribes of Central India.

Objectives: Folk-lore survey and inventory collection, identification and documentation of plants used by the tribes.

Achievements

Ethnobotanical studies in Balaghat, Chhindwara and Jabalpur districts were conducted and data on 32 plant species used by the tribes for various purposes were gathered. The information was critically screened with the available literature which revealed that the uses of 5 probable potential plant species (listed below) are recorded for the first time. These are recommended for further phytochemical and nutritional analysis, which might result in the discovery of new drug compounds and food values.

<i>Caesalpinia bonduc</i>	-	root bark is used to cure epilepsy.
<i>Cayratia pedata</i>	-	leaves are edible.
<i>Chloroxylon swietenia</i>	-	Leaves used as mosquito-repellent.
<i>Naravelia zeylanica</i>	-	tubers are edible.
<i>Strychnos potatorum</i>	-	Stembark is used to cure fever.

Project 38: Seed collection and storage in seed bank.

Objectives: Survey and identification of seed sources/provenances. Collection, processing and storage of quality seeds. Distribution of quality seeds.

Achievements

Seeds of 12 forestry species were collected. Germination tests and treatment of seeds under storage are being carried out quarterly for all the seeds. Seed source data sheets have been prepared and supplied alongwith the seeds dispatched to concerned organisations.

Project 39: Productivity Enhancement - Management for People's Participation (Ford Foundation).

Objectives: Socio-economic Surveys for documentation of short term and long term needs and expectations of people for development of socially acceptable and economically viable technology.

Achievements

Madhya Pradesh Site: Socio-economic and demographic surveys were conducted through Participatory Rural Appraisal (PRA) technique, in all the selected villages. Resource

mapping, consumption assessments, forest and agricultural products calendar, time trends, wealth ranking, future needs assessment, expectations, details regarding forest protection committees etc. were recorded for developing management alternatives through field experiments. The forest area accessed by the villagers was surveyed for species diversity, by laying out quadrats randomly.

The results of socio-economic and demographic surveys have been compiled and analysed. Formulation of local yield tables of *Madhuca longifolia* flowers and seeds and fruits of *char* i.e. *Buchanania lanzan* based on girth class and crown area, is in progress. The yield figures from marked *mahua* and *char* trees have been collected and compiled for the first season. The data collected during vegetational survey have been analyzed and relative density, frequency, dominance etc. have been calculated.

Orissa Site: PRA (Participatory Rural Appraisal) of village Radhiapali was recast and reviewed. Fresh PRA of newly selected village Kunjapali was conducted by the project team. Vegetation studies of the five villages namely Radhiapali, Kunjapali, Gadgadabhal, Krishna Nagar and Gheekundi have been completed. Yield study of *Mahua* flowers was conducted and completed. Demonstration and extension of Mushroom cultivation as a support activity was initiated in July, 1997 in both villages. The cultivation is going on in village Kunjapali and production and expenditure details have been regularly recorded. During the year 1996 and 1997 the villagers were motivated to plant seeds/seedlings of MPT species in their own homestead plots and fields so as to get fodder and fuelwood on sustained basis.

Project 40: Development of agroforestry models for the various agro-ecological regions. (NABARD).

Objectives: Socio-economic survey of selected micro-watersheds. Economic analysis of existing A/F systems. Selection of MPTs for investigation in A/F systems. Introduction of biofertilizers in A/F plantations and evaluation of their potentiality in enhancing productivity.

Achievements

Selection of micro-watershed was completed which was followed by socio-economic and land use pattern survey. Experimental models on Agri-silviculture, silvi-Horticulture were laid out in farmers field in all micro-watersheds. VAM and Rhizobium strains were isolated and multiplied by Pathology Division and were applied in the field plantations. Data on growth of trees and agricultural crop production were procured from existing A/F systems. Recording of growth of plants is in progress.

Project 41: Strengthening and Developing ICFRE and its institute. (UNDP).

Objectives: Distribution of quality planting stock for raising Demonstration plantations. Training Programmes in Demonstration villages. Technology Transfer and Demonstrations to selected groups. Preparation, publication and distribution of publicity material.

Achievements

Four thousand rhizomes of Bamboo (*Dendrocalamus strictus*) and 2,000 plants of Neem, Babool, Shisham and Mulberry have been distributed among the user groups, mainly farmers 300 plants of fruits yielding species were distributed among the farmers of Duamali Villages in Kanker.

As many as 21 on-farm demonstration programmes were organised in which 430 people took part and they were trained on management of plantation especially bamboo with meaningful interaction.

A special training programmes of 2 days organised for farmers, women and NGO's on management of Bamboo and others forest produces in which 58 farmers, 3 NGO's and 6 women participated. Pamphlets and booklet were distributed to the farmer/villagers and other user groups especially in rural areas.

NEW PROJECTS TAKEN UP IN HAND DURING 1997-98

NIL

EXTENSION

Demonstrated TFRI developed technologies in "*Swarozgar Mela*" held at Jabalpur on 20-23 Dec. 97, and in "*Kisan Mela*" held at Bilaspur. Technology on biofertilizer was demonstrated at Yavatmal, Maharashtra. Low cost huts for cultivation of Oyster mushroom were established in Jabalpur Division. Drum type dryers were established in two villages of Jabalpur district and at Sambalpur district of Orissa. Monitoring of various plots of Agroforestry was carried out by the scientist and expert from Institute in Balaghat, Bilaspur and Raipur area of M.P. Demonstration and lectures were arranged for a group of 28 Lecturers and Assistant Professor from various Universities of M.P. under a programme organised by Academic Staff College R.D. University, Jabalpur. Lectures and demonstrations were also organised for visiting farmers, school children, Forest Management Students from IIFM, Bhopal, etc.

A workshop on Socio-economic aspects and Gender issues in forestry and Forestry Research was organised from 21st to 29th August 97. Workshops on Entomology, Genetics and Biofertilizers were held from 30.9.97 to 7.10.97. A workshop on Modern Research cum Demonstration Nurseries, was held on 13-14.10.97. A training was organised for employees of IFFDC project Sagar on various techniques of silviculture, biofertilisers and agroforestry. Two Training cum Workshops on "Promotion and value addition of Non Wood Forest Products", were organised at Chhindwara and Jabalpur during March 98. To commemorate the 50th year of India's Independence, a painting competition for local school children from class I to class XII on Environmental awareness was organised. Around 520 students from different school participated in the competition.

Translation of *Neem* and Bamboo brochures in Marathi was completed and published. Translation and publication of *Neem* brochure in Oriya was completed and is being distributed through the Orissa Forest Department. Translation of Bamboo brochure in Oriya is in progress. Extension literature on various forestry subjects has been published.

Under the UNDP-ICFRE Project a VHS Video film titled - "*Forestry at your Doorstep*", has been made. Under IDRC Project a VHS video - "*Bamboo, from Forests to Farmers' Fields*", has been prepared. Under WB (FREE) Project, two Betacam Films, of telecast quality, titled - "*Bamboo, a Gift of Nature*", meant for general public and "*Bamboo, Promising Gains*", for technology users, have been completed.

FINANCIAL STATEMENT

SUB HEAD	EXPENDITURE (in Rupees)
PLAN	
(A) REVENUE EXPENDITURE	
a. RESEARCH	1,82,84,470
b. ADMINISTRATIVE SUPPORT	57,73,672
Total for Revenue exp. (a) + (b)	2,40,58,142
(B) LOAN & ADVANCES	4,42,500
(C) CAPITAL EXPENDITURE	26,45,729
GRAND TOTAL FOR (A+B+C+)	2,71,46,371
EXTERNALLY AIDED PROJECTS	
NABARD	2,69,287
SAIL	10,905
Total for externally aided	2,80,192
GRAND TOTAL for plan	2,74,26,563
WORLD BANK PROJECT	1,10,24,006
UNDP PROJECT	4,15,507
IDRC PROJECT	2,05,298
FORD FOUNDATION	17,08,764
NON-PLAN	
(A) REVENUE EXPENDITURE	
a. RESEARCH	16,74,555
b. ADMINISTRATIVE SUPPORT	25,00,884
GRAND TOTAL FOR NON-PLAN	41,75,439